In-session Predictors of Self-Harm Behavior in Dialectical Behavior Therapy

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ABSTRACT

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Purpose: Therapists are often charged with the seemingly impossible task of predicting their client's future behavior, particularly behavior that may result in harm or death. Adverse events (AE) refer to a constellation of behaviors or events that interfere with treatment and exhibit a risk to the safety of the patient, which include suicide attempts, non-suicidal self injury (NSSI) and suicidal ideation. This is the first study that seeks to identify and associate in-session markers in DBT prior to AEs.

Method: The proposed study sought to identify whether ruptures in therapeutic alliance (3RS; Eubanks-Carter, Muran & Safran, 2015), the frequency and intensity of negative-self referential speech (LIWC2015; Pennebaker, Booth, Boyd & Francis, 2015) and periods of psychomotor agitation are associated with AEs within a course of Dialectical Behavior Therapy (DBT). By coding videotaped psychotherapy sessions (n = 98) across 21 patients diagnosed with Borderline Personality Disorder (BPD), the researchers prospectively examined the association between in-session phenomena during the session prior to an AE. Exploratory logistic multilevel modeling, mean comparison and latent profile analysis (LPA) techniques were used to identified in-session markers associated with adverse events across the course of DBT treatment.

Results: Using a multilevel model building approach to account for the nested structure, increases in content/affect split was associated with increased likelihood (36% increase in log-odds) of NSSI occurrence reported in the subsequent session when controlling for frequency of past NSSI episodes. When controlling for prior suicide attempts, withdrawal and confrontation ruptures did not predict the occurrence of suicide attempts in the subsequent session. To further

examine the heterogeneity of the Level 1 variables (i.e., in-session markers), the LPA fitted a five-profile solution that captured relative differences in mean frequencies of coded markers. The latent "session types" were named based on their in-session characteristics, with AEs identified post-hoc within the identified profiles. While AEs were distributed across multiple profiles, visual inspection aligned with the findings in the multilevel model. Sessions characterized by elevations in content/affect split and behaviors that distance from the therapist preceded NSSI during treatment. The majority of the sessions prior to suicide attempts (70%) \ were assigned to the profile with the lowest mean frequency of in-session markers.

Clinical implications: The strength of the therapeutic alliance in DBT is an essential component of effective treatment. Therapeutic ruptures, particularly withdrawal ruptures, occur frequently in DBT treatment. Attending to these ruptures, especially occasions when a patient's affect and verbal content are not congruent, may signal to the therapist that the patient requires additional support. In-session content/affect split may represent a vulnerability factor that puts the patient at increased risk of NSSI behavior due difficulty attuning to their internal experiences and limitations in their emotional flexibility.

Limitations: Similar to other studies that examine self-harm, the low base-rate of suicide attempts and NSSI behavior complicates empirical study. Since the study utilized strict inclusion criteria for only individuals diagnosed with BPD, findings cannot be generalized to patients with other psychiatric diagnoses. While some therapist effects are controlled for in the study since one therapist treated all the patient included in the study, the study does not account for therapist factors that may influence the therapy dyad. Given the limited sample size, there was not adequate power to fit more complicated models (e.g., inter-level and intra-level interactions, random effect predictor variables, etc.).

TABLE OF CONTENTS

List of Tables

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Dedication

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Introduction

Suicide is now one of the leading causes of death among individuals between the ages of 25-50 in the United States, and accounts for greater mortality than automobile accidents, or homicide (CDC, 2018). It has long been known that suicidal behavior occurs primarily in the context of mental illness, with the vast majority of completed suicides committed by individuals with psychiatric histories (Maris, 1995). Moreover, a large proportion of completed suicides occur within one month of seeing a clinician (Isometsa, et al., 1995). As a clinical phenomenon, it is often assumed that suicide is a preventable cause of death that demands better assessment and intervention. However, despite decades of clinical research and billions of dollars of funding (e.g., NIH, 2017), identifying individuals at imminent risk of self-harm continues to vex clinicians and researchers alike. Rates of completed suicide have continued to rise yearly (CDC, 2018), while efforts to develop assessments with high predictive validity have yielded few applicable insights. The current state-of-the-art in suicide risk assessment hinges on interviews and self-report inventories that do not adequately identify individuals at imminent risk (Franklin et al., 2016; Belsher et al., 2019). These strategies that favor sensitivity over specificity, may classify *who* is more likely to engage in self-harm; however, there is no indication of a proximal timeframe for *when* self-harm behavior may manifest. In clinical practice, suicide risk assessment is typically predicated on the assumption that the patient feels comfortable enough during the clinical encounter to disclose troubling thoughts, suicide intent, etc. (Fowler, 2012). Aspects of the therapeutic process, such as ruptures and observable client behaviors, may modulate the client's willingness to discuss issues regarding self-harm. Changes in the patient's mental status may yield shifts in the therapeutic alliance that may also highlight decompensation or increased suicide risk (e.g., Yasmeen et al., 2017).

The therapeutic alliance has been demonstrated across modalities to be a significant predictor of the effectiveness and efficacy of psychotherapy (e.g., Flückiger et al., 2012). Few studies, however, have systematically examined the nature and impact of therapeutic alliance within Dialectical Behavior Therapy (DBT) for high-risk patients. Bedics et al. (2015) compared the relationship between self-reported therapeutic alliance and frequency of NSSI across DBT and community-based "treatment by experts". Compared to the DBT sample, the community-based sample had a 33% increase in NSSI behavior per unit of the alliance measure. This paradoxical effect noted in the treatment-as-usual group suggests that strategies specific to DBT may mitigate the extent of self-injurious behavior. DBT focuses on "therapy interfering behaviors," including self-injury behavior, at the exclusion of other themes when they are broached in session. Also, because DBT encourages a tone that is often neutral, irreverent and matter-of-fact, therapists may reduce the likelihood of inadvertently reinforcing aversive behaviors (Linehan, 2015). Nonetheless, more symptomatic DBT patients, particularly those with higher levels of depression, anxiety, and hopelessness, were less likely to report a positive therapeutic alliance, despite improvements in treatment (Richardson-Vejlgaard et al., 2013). Hirsch et al. (2012) found that the relationship between therapeutic alliance and clinical outcomes was stronger among patients who scored higher on a trait measure of agreeableness. These studies illustrate the complex relationship between therapeutic alliance and factors that may inadvertently impact the effectiveness of treatment.

To explore in-session relational factors that modulate therapeutic alliance, the current study utilized an observer-rated measure of therapeutic alliance that captured the frequency of withdrawal and confrontation ruptures as they manifested during sessions (3RS; Eubanks-Carter, Muran & Safran, 2015). With each session divided into five-minute intervals, these withdrawal

and confrontation ruptures were grouped into various descriptive categories based on the nature of the behavior and interaction.

To our knowledge, only one other study has utilized the observer-rated Rupture Resolution Rating System (3RS) within the context of DBT treatment. All other studies examining therapeutic alliance and process factors within DBT have used self-report measures (e.g., Working Alliance Inventory) that rely on the therapist and patient to rate their subjective experience of the therapeutic relationship. Observer-based measures within psychotherapy research have been shown to identify more subtle and nuanced information that is often missed or minimized in self-report assessments (Eubanks-Carter et al., 2010). When examined in conjunction with other in-session variables – including negative self-referential speech and physical agitation – we hoped to further understand how relational factors in the therapeutic dyad could be associated with outcomes in psychotherapy, primarily outcomes linked to patient safety.

Common types of self-harm targeted during psychotherapy

During the course of psychotherapy treatment, therapists are charged with assessing and maintaining the safety of their patients. Often, clinicians must weigh a multitude of factors in order to proactively address behaviors that may result in bodily harm or death. Adverse events (AE) refer to any unfavorable behavior or event that impacts the progress of treatment, which may include suicidal behaviors or gestures, acute suicidal ideation and non-suicidal self injury (NSSI). Because of severe consequences related to the AEs, therapists remain vigilant to signs or indications that may increase the likelihood of such events. The following sections explore the phenomenology of the various AEs of interest in the current study.

Suicidal behavior.

In the United States, an average of 105 individuals died every day by suicide (CDC, 2010). Death by suicide has been increasing from 1999 to 2016 in the United States, with half of the states in the US seeing a 30% increase. (CDC, 2018). In 12 states within the United States, the suicide rate increased by 38-58%. Suicide-related emergency room visits in the US outnumber completed suicides by a factor of nearly 10 (CDC, 2011), further illustrating the frequency of suicide attempts or gestures. With these increasing numbers, there has been an increased urgency to identify evidence-based approaches to suicide risk assessment.

While suicidal behavior is often associated with individuals suffering from depression, patients suffering from Borderline Personality Disorder (BPD) are also at elevated risk of dying by suicide. Based on a series of longitudinal studies, 3-10% of BPD patients eventually die by suicide (Temes et al., 2019; Paris & Zweig-Frnak, 2001; McGlashan, 1986; Stone, Stone & Hurt, 1987). Individuals with BPD make up about 9-33% of deaths by suicide in the general population (Runeson & Beskow, 1991; Kullgren, Renberg & Jacobsson, 1986). A prospective study followed individuals carrying a BPD diagnosis for 24 years and identified substantially disproportionate rates of mortality. At follow-up, 5.9% of the BPD sample died by suicide compared to a non-BPD personality-disordered control group (1.4%). Additionally, 14% of the BPD group died of non-suicide related causes compared to 5.5% of the comparison group (Temes, Frankenburg, Fitzmaurice & Zanarini, 2019). These findings suggest that individuals suffering from BPD are at elevated risk of premature death by suicide and other causes. Due to the chronicity of the disorder, at the time of the patients' deaths approximately 88% of the sample had not "recovered" from the disorder.

To assess imminent risk of suicide, clinicians often rely on their clinical experience, intuition or patient-reported experiences to discern suicide risk. Clinicians assess suicide risk by asking a patient about factors known to be associated with increased likelihood of suicidal behavior. Coupled with a mental status examination, clinicians inquire about suicidal ideation, the existence of a plan to end life, the intent and means to carry out the stated plan, as well as any preparatory actions towards ending life (e.g., Maltsberger, 1988). With unstructured questioning that relies heavily on patient disclosure to evaluate risk, patients may be motivated to withhold or actively conceal their suicidal intent to avoid hospitalization, stigmatization or interference with their plans (Blanchard & Farber, 2018). Compounding this complexity, the temporal limitations of psychotherapy force therapists to infer future suicide risk based on present-centric snapshots. Since suicidality fluctuates rapidly over time and context, in and out of the therapy room, therapists adapt to moving targets. To determine relative risk, clinicians leverage findings of clinical research that identify risk factors (e.g., patient history, age, family history, demographics, etc.) in an attempt to garner relative suicide risk. Despite identifying characteristics associated with suicidal behavior and determining a client to be "high risk," this clinical data does not adequately specify those at imminent risk, nor does the information reliably predict the timing of when suicidal behavior will be initiated. Despite advances in understanding distal risk factors for suicide behavior, risk assessment continues to be plagued by poor predictive validity when attempting to identify individuals at imminent risk for suicide. A recent meta-analysis examining risk factors for suicidal behavior demonstrated that studies have failed to achieve adequate predictive power to identify near-term or imminent suicide risk at the individual level (Franklin et al., 2016). Particularly challenging, a retrospective analysis of 76 deaths by suicide found that 78% of individuals completing suicide denied any suicidal ideation

or intent during their previous risk assessment (Busch et al., 2003). Of these patients, 28% had "contracted for safety," while 34% were assessed to have little or no acute risk for suicide. In another suicide autopsy study, Busch and Fawcett (2004) found that 67% of patients in their sample denied suicidal intent one week prior to death by suicide. The literature highlights a need for discrete non-explicit measures, that emphasize specificity, to identify individuals at risk of suicidal behavior and the proximal timeframe of when the behavior occurs.

Non-suicidal self injury (NSSI).

Non-suicidal self-injury (NSSI) refers to self-directed physical aggression in the form of cutting, hitting, slapping, or scratching or poisoning oneself, without the intent of ending life. Highly prevalent in the United States, NSSI affects around 23% of adolescents with lifetime prevalence being around 33% (Jacobson & Gould, 2007; Swannell et al., 2014). The phenomenon is particularly prevalent in clinical settings, with some studies identifying up to 45% of individuals in community clinics engaging in such behavior (Lloyd-Richardson, Perrine, Dierker & Kelly, 2007). For individuals suffering from BPD, studies suggest that rates of NSSI could be as high as 70-80% (e.g., Clarkin et al., 1983). NSSI may serve to negatively reinforce distressing and discomforting feelings in the absence of other methods of coping. While individuals who engage in NSSI do not intend to end their life, mortality is possible in the context of an accident, initiating tissue damage that is graver than intended.

Given the differential functions of NSSI and suicidal behavior, researchers are considering the two types of self-harm as distinct constructs. The shift from describing the behavior as "parasuicide" to "non-suicidal self injury" demonstrates the separation between the two phenomena. Using a confirmatory factor analysis, researchers examined whether suicidality and NSSI are on the same dimension or can be considered distinct phenomena (Evans & Simms,

2019). By using self-harm scales, diagnostic interviews and personality measures, the study found that there is evidence to support a two-factor model of self-harm; however, there was substantial overlap in the factors included in the analysis. The study found that NSSI behavior was associated more closely with interpersonal functions, such as attention seeking; whereas, suicidality was more closely associated with anhedonia. Addressing the overlap, evidence in the suicidality literature emphasizes that NSSI behavior is an important risk factor for future suicidal behavior, increasing intent and capacity to end one's life (Klonsky, May & Glenn, 2013). NSSI may inadvertently desensitize individuals to bodily harm, which gradually erodes fundamental protective factors, such as pain and blood aversion that may inhibit the initiation of suicidal actions.

Recent studies have identified complex factors that either initiate or inhibit self-harm behavior by mapping the temporal sequence of events that result in NSSI. For example, a growing body of literature is emerging that suggests that individuals who engage in NSSI have difficulty inhibiting behavioral responses to negative affective environmental cues. In a laboratory study, participants were given an Emotional Stop-Signal Task that required the participants to rapidly respond to positively and negatively valenced content (Allen and Hooley, 2015). Occasionally during the task, participants were shown a "stop signal" indicating that they should inhibit responding. Those participants with a history of NSSI exhibited difficulty inhibiting their behavioral response (Allen & Hooley, 2015).

Allen & Hooley (2017) reported that adults who engaged in NSSI performed similarly to healthy controls in tasks related to impulse control. However, when the tasks involved exposure negative emotional stimuli, those with a history of NSSI were much less able to control their responding (Allen & Hooley, 2018). The authors further induced a negative mood state to

examine whether mood-dependent changes in impulsivity may account for NSSI behavior. They found no association with negative mood induction and NSSI, indicating that the loss of impulse control among individuals who engage in NSSI is context dependent, and not mood-dependent. The initiation of NSSI behavior may intersect with momentary situational factors that impair the individual's ability to maintain behavioral control. In contrast, Ammerman et al. 2017 have found that low distress tolerance was a stronger predictor of NSSI compared to the nature of daily experiences in a study using ecological momentary assessment. Researchers have also found that NSSI behaviors are often socially reinforced (e.g., to avoid school, work, or other activities) and automatically reinforced (e.g., to stop bad feelings) allowing individuals to regulate their emotional and physical experiences (Nock & Prinstein, 2004; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007). Affective dysregulation appears to have different intra- and inter-personal functions, with intrapersonal functions of NSSI primarily modulating negative feelings; while interpersonal dysfunction symptoms seem to be linked to interpersonal functions of NSSI, such as support seeking (Sadeh et al., 2014).

In-session markers possibly associated with adverse events

Ruptures in the therapeutic alliance.

Decades of psychotherapy research, across multiple orientations, have highlighted the essential role of therapeutic alliance in treatment outcomes (e.g., Leahy, 2008; Norcross, 2002; Farber, Suzuki & Lynch, 2018). Broadly defined, therapeutic alliance refers to the collaboration and relational bond established between the client and the therapist. As a common factor of all modalities of psychotherapy, some posited that therapeutic alliance may contribute to positive therapeutic outcomes more so than the treatment modality (e.g., Safran & Muran, 1995). A meta-analysis examining 79 studies that measured therapeutic alliance with other symptom-

based outcomes found that ratings of therapeutic alliance were moderately associated with the reduction of various psychological symptoms (Martin, Garske & Davis, 2000).

Safran and Muran (2006) defined a rupture in the therapeutic alliance as a tension or misunderstanding in the relationship between therapist and client. Phenomenologically, the authors identified two different types of alliance ruptures: 1) confrontation (CF) ruptures, during which the patient expresses her or his dissatisfaction in a hostile manner, and 2) withdrawal (WD) ruptures, characterized as a patient's avoidance or resistance to the therapist. Although ruptures are considered to be common in therapy, these events may be difficult to recognize by the patient or the therapist, hindering opportunities to facilitate a resolution (Coutinho, Ribeiro, Sousa, & Safran, 2014). Since ruptures contribute to, and detract from, the overall levels of therapeutic alliance, rupture markers have consistently shown to be a reliable predictor of therapy outcome (Coutinho et al., 2014). However, the process of recognizing and addressing ruptures may be difficult due to the fact that both therapists and clients tend to withhold negative feelings (Regan & Hill, 1992). Moreover, another study found that even highly experienced therapists were unable to recognize hidden negative feelings in their clients 50% of the time (Hill et al., 1993). When examining ruptures over the course of therapy, Coutinho et al. (2011) explored therapists' and clients' experiences of alliance rupture events for the first 15 sessions of each of eight cases. Of note, the four clients who eventually dropped out of treatment had more confrontation events in their final several sessions, as opposed to withdrawal events that were mores spread out across sessions. Overall, by investigating and comparing the perspectives of both therapists and clients, the researchers found that their participants agreed that typical antecedents of ruptures were interventions that incorporated a new perspective on painful topics and their exploration. Both patients and therapists also agreed that therapists were more effective

in dealing with withdrawal ruptures, as opposed to confrontation ruptures, and that both felt lost or confused during these types of the events. However, their internal experiences diverged as the therapists reported more negative feelings, such as incompetence related to their performance, whereas patients reported more feelings, such as sadness.

Researchers have attempted to identify the frequency of therapeutic ruptures and their relationship with psychotherapy outcomes. Horvath and Greenberg (1989) developed the Working Alliance Inventory (WAI), which allows both the patient and therapist to report on various aspects of the therapeutic alliance. However, some researchers argue that self-report accounting of ruptures may underreport the events because of lack of awareness, discomfort or unwillingness to acknowledge interpersonal discord (Coutinho, et al., 2014). Coutinho et al. (2014) compared the Working Alliance Inventory (WAI) and an observational Rupture Resolution Rating System (3RS; Eubanks-Carter, Muran & Safran, 2015) to determine whether observational analysis would better detect alliance ruptures during therapy sessions. The researchers examined the longitudinal data from 201-videotaped sessions of 38 good- and poor-outcome cases of patient- therapist dyads in a cognitive behavioral therapy. After comparing the results of the WAI that patients completed at the end of each session and the results of 3RS completed by six judges, the researchers found that observational 3RS detected ruptures missed on the WAI.

To assess components of therapeutic alliance, the 3RS is one of the only valid and reliable observer-based methodologies. Originally designed to assess ruptures and resolution strategies within Cognitive Behavioral Therapy (CBT), the 3RS has been shown to be applicable across modalities (Eubanks, Lubitz, Muran & Safran, 2019; Boritz et al., 2018). Per the developers, ruptures occur across treatment modality, therapist's level of training and length of

current treatment (Eubanks-Carter et al., 2015). Since its development, the 3RS coding scheme has been utilized to measure ruptures and resolutions in therapy with relation to various outcomes. A recent updated validation study found that confrontation markers, successful resolutions of ruptures, and ratings of the therapist's contribution to ruptures predicted premature termination from psychotherapy (Eubanks, Lubitz, Muran & Safran, 2019). The coding scheme has also been utilized to assess ruptures in Cognitive Analytic Therapy for BPD youth (Daly, Llewelyn, McDougall & Chanen, 2010), CBT (Cash, Hardy, Kellett & Parry, 2014) and DBT (Boritz et al., 2018).

Negative self-talk (Negative self-referential speech).

Negative self-referential speech refers to instances of disparaging verbal content that patients direct towards themselves. The Emotional Cascade Model (ECM; Selby & Joiner, 2009; Selby et al., 2013) posits that negative rumination contributes to NSSI among individuals with BPD by reactivating and intensifying negative emotions, thereby disinhibiting behavioral impulses. Low levels of positive affect appears to moderate the relationship between self-criticism/brooding and NSSI (Cohen et al., 2015).

It is well recognized that individuals perform better on tasks when engaging in positive self-talk as opposed to negative self-talk (Raalte et al., 1995; Tod, Hardy & Oliver, 2011), and the believability of negative self-talk is positively associated with greater levels of psychological distress (Duff, Larsson & McHugh, 2015). Research in clinical neuroscience has shown that positive self-appraisal is associated with activation in brain regions that are known to process emotion-related stimuli such as the amygdala, ventral striatum and anterior cingulate cortex, whereas negative self-appraisal has a stronger influence on perception-related brain activity including the occipital regions (Brühl et al., 2014). Depressed patients also showed hyperactivity

in the medial prefrontal cortex (MPFC) during self-referential processing of negative words compared to non-clinical controls (Yoshimura et al., 2014).

Psychomotor Agitation.

Agitation refers to a state characterized behaviorally by pacing, fidgeting, trembling or other purposeless activity, coupled with a subjective sense of intense psychic discomfort, irritability or anxiety. Despite the problematic overreliance on patient-report data for assessing suicide risk, agitation is one observable factor that has been strongly associated with suicidal behavior. In a retrospective study of completed suicides in an inpatient psychiatric ward, 79% of individuals completing suicide had reported extreme anxiety or agitation in recent risk assessments (Busch, Fawcett & Jacobs, 2003). Additionally, 90% of non-violent suicide attempters seen in the emergency room setting reported significant irritability and agitation prior to their attempt (Balázs et al, 2006). Among individuals suffering from depression, those with acute psychomotor agitation reported more frequent suicidal ideation than non-agitated controls (Olgiati, Serretti & Colombo, 2006), and psychomotor agitation and irritability were found to be present in 90% of suicide attempters with mixed depression (Akiskal & Benazzi, 2005). Despite such associations, we know of no prospective studies examining this observable phenomenon as a near-term predictor of self injurious behavior. Indeed, no published studies to date have used observational measures to examine psychotherapy sessions prior to self-harm behavior, such as NSSI and suicide attempts. Most studies have utilized retrospective self-report measures to examine the therapeutic alliance, self-harm behavior and other clinical factors.

The current study observes therapy content "as if present" in the session, using a valid and reliable coding methodology. By prospectively examining factors prior to AEs, a we hope to

identify subtle behavioral signs that may be associated with future risk of self injurious behavior in patients.

Research questions

1. What is the mean frequency of in-sessions factors (i.e., withdrawal and confrontation ruptures, negative self-talk, psychomotor agitation) in the session prior to the occurrence of self-harm events in DBT treatment?
2. Is there an association between in-session factors (i.e., withdrawal and confrontation ruptures, negative self-talk, psychomotor agitation) in the session prior to the occurrence of self-harm events?
3. Which specific types of in-session markers (i.e., withdrawal and confrontation ruptures, negative self-talk, psychomotor agitation) have the strongest association during the session prior to self-harm events?

Methods

Participants

Participants in this community-based, clinically-referred sample were a subset of a larger sample that was recruited to participate in a randomized controlled trial (RCT) comparing DBT to supportive psychotherapy and antidepressant medications. Each DBT session was videotaped to assure therapist fidelity with manualized treatment. Twenty-two participants who met criteria for Borderline Personality Disorder (BPD) via a structured assessment administered by a clinical psychologist (First, Spitzer, Gibbon & Williams, 1997; SCID I and II) were randomized to the DBT arm of the study. Each participant received six months of comprehensive DBT treatment. The current study utilizes a subset of these sessions that were videotaped. The number of sessions per case ranges from eight to 30, with a total of 300+ hours of videotaped therapeutic

content. All sessions were conducted by a single therapist who adhered to the treatment paradigm as described in the *Behavioral Tech*, Linehan Institute Training.

Sample Demographics.

The sample disproportionately consisted of females (91%), which may be reflective of the gender disparity in the treatment seeking population as well as the gender disparity among BPD diagnosing (Silberschmidt et al., 2015). More than half of the sample (54%) identified as White or Caucasian, with the second most prevalent reported race as "more than one" (23%). Fourteen percent identified as Black, and 9% identified as Asian. There were no Latino/a participants in this sample. The average age of the participants in the sample was 31.6 years old (*SD* = 12.3), with a range of ages spanning 19 to 62 years. The majority of the sample (73%) identified as heterosexual, while substantially fewer participants identified as homosexual (14%), bisexual (9%) or "not sure" (4%). This was a well-educated sample, with only 9% having a high school diploma or lower. The majority of the sample had completed at least some college level coursework: 41% had completed "some" college, 36% had graduated from college, and 14% had completed a graduate or professional degree (Average 15.2 year of education). The modal household income (46%) was below $30,000 per year. However, there was substantial variability in household income, with 32% of households making more than $60,000 per year (see Table 3 for further sample demographics, including counts).

Clinical Factors.

Clinically, the sample was screened and selected with the intention of including participants with a history of acute psychiatric concerns, primarily non-suicidal self injury (NSSI) and suicide attempts. In addition to meeting the criteria for BPD, 86% of the sample participants had a comorbid Axis I disorder, with the majority of those individuals carrying an

additional diagnosis of Major Depressive Disorder (82%). During an intake interview, about one third of the sample (32%) disclosed some form of recreational substance use. Cannabis use made up the largest proportion of reported substance use by the study participants (23%), while stimulants (13%) and opiates (13%) were reportedly less used in the sample. The majority of the sample (77%) reported some form of lifetime abuse: 23% reported exclusively physical abuse, 23% exclusively sexual abuse and 31% disclosed both physical and sexual abuse. Because of the nature of the RCT study, the participants included in this current study did not receive antidepressant medications. At the consultation with the study psychiatrist, however, participants could utilize as needed medications (PRN) to address acute sleep disturbance (Zolpidem; 9%) or acute anxiety (Clonazepam; 23%). The majority of the sample (96%) had engaged in some form of psychotherapy prior to enrolling in the study.

Self harm behavior.

During the baseline assessment and intake interviews, participants were assessed for their history of self-harm behavior, including suicide attempts and episodes of NSSI.

When assessing the history of self-reported suicide attempts, the majority of the sample (95%) reported at least one prior lifetime suicide attempt. The modal range of reported lifetime suicide attempts was two to five attempts (27%), followed by six to ten lifetime suicide attempts (23%). One participant in the sample reported over 50 lifetime suicide attempts (see Table 5 for the distribution of suicide attempt frequency prior to enrollment in the study).

When assessing lifetime episodes of NSSI, the majority of the sample (91%) reported a history of life-time self-injury. Nearly half of the sample (44%) engaged in more than 50 discrete episodes of lifetime NSSI prior to enrollment in the study, while an additional 26% reported 25-50 lifetime episodes. Meanwhile, 13% of the sample denied any history of NSSI. In the month

prior to treatment, the majority of the sample (82%) engaged in at least one episode of NSSI (see Table 6 for the distribution of NSSI frequency prior to enrollment in the study).

Dialectical Behavior Therapy

Originally developed specifically to treat suicidal behavior (Linehan et al, 1993), DBT is a structured behavioral therapy that involves individual psychotherapy, group skills training, on-call phone coaching by the therapist, and regular treatment team consultation (Linehan, 1993; Linehan, 2015). The content presented within the DBT skills groups is broken down into four modules: distress tolerance, mindfulness, emotion regulation, and interpersonal effectiveness (Linehan, 1993). DBT combines the use of behavioral skill building with emotional awareness and acceptance-oriented interventions. The "dialectical" approach is one where the treatment continuously strives to achieve a balance between seemingly paradoxical experiences, such as acceptance and change, autonomy and control, loving and challenging. To target self-harm behavior, clients fill out diary cards between sessions that track target behaviors and the contextual factors associated with them. Each week, the therapist reviews the diary card to determine whether the client engaged in target behaviors, such as NSSI, suicidal ideation, risky substance use, etc. If one of the behaviors is reported during the week, the therapist will explore with the client his or her understanding of the event, or conduct a behavioral chain analysis: a systematic review of vulnerability factors, thoughts, emotions, sensations, and behaviors that precipitated the event. If self-harm behavior is present, the immediate focus of the session is shifted to address this, and identify skills that can be used to prevent future occurrences.

Based on an ever-growing body of literature, Dialectical Behavior Therapy (DBT) has been demonstrated to reduce instances of suicidal ideation, suicidal behavior, and NSSI. Many studies highlight the effectiveness in reducing suicidal behaviors, suicidal ideation, and NSSI in

varied adult populations (Stanley et al., 2007; Van Goethem et al., 2015; van den Bosch et al., 2005). For instance, Van Goethem et al. (2015, p. 41) described an "erratic course" of NSSI behavior over the course of treatment, but the urges and frequency of self-harm was overall extinguished in their sample by the time treatment ended. Based on the structure of the treatment, the therapist will prioritize AEs with the intention of extinguishing the behavior and mitigating risk. The aim is for AEs to be progressively less frequent and build on the previous learning and skill development. There is evidence suggesting that the extinction of NSSI behavior lasts beyond treatment. At a six month follow up post-treatment, a longitudinal study found that DBT yielded sustained effects in the reduction of NSSI and impulsive behavior (van den Bosch et al., 2005).

Participants in the current study were offered six months of DBT treatment that targeted self harm behaviors and other symptoms associated with BPD. While each participant completed similar numbers of sessions, the number of videotaped sessions available for the current study varied. For the subsample utilized in the study, there were an average of 16.7 available sessions per participant that were eligible to be coded (SD = 7.4). Therapy sessions typically lasted 45 minutes; however, some sessions approached the hour mark.

Concurrent with the course of individual therapy sessions, each participant attended 90-minute DBT Skills groups, which provided psychoeducation and skill building didactics. In moments of crisis between therapy or group sessions, participants are offered telephone coaching to provide in vivo counseling and support. These conjunctive services are part of the standardized DBT treatment course.

Approvals obtained for the current study

Prior to the coding of the videotaped data, researchers negotiated a data use agreement with the principal investigator of the RCT study, Barbara Stanley, Ph.D., (October 24, 2017), granting access to selected self-report measures and use of the video content. The Teachers College Institutional Review Board (IRB) approved the study on November 16, 2017 (TC IRB#: 18-110). The study met criteria for Expedited Review since the data was already collected and the intensive procedure and infrastructure to securely maintain all data. At time of writing, the IRB remains open with no adverse events or issues with compliance.

Procedure

Study materials

Study clinicians videotaped the sessions via a discrete digital camera (Sony Corporation, 2008) that was aimed towards the patient and therapist. Captured sessions were stored as .MP4, or .WMA file formats or burned to an 8 cm DVD-R for later viewing. Coders viewed the footage using VLC Media Player for Mac OS X (Version 3.0.3; VideoLan Organization., n.d.) since it shows the running time while viewing the content. As video content is coded, all sessions recorded in the DVD-R mini format were converted to .MP4 format and stored on an encrypted external hard drive (Western Digital, 2016). This process facilitated ease of coding as well as a more secure method for storing the confidential materials.

Measures

Rupture Resolution Rating System (3RS).

In order to better detect rupture events in therapeutic alliance and their therapist resolutions, Eubanks-Carter et al. (2015) developed the observer-based Rupture Resolution Rating System (3RS) that draws on Bordin's (1979) conceptualization of alliance. According to

the coding manual, therapeutic alliance and ruptures are defined as follows:

> The alliance is composed of 1) agreement between patient and therapist on the tasks of treatment; 2) agreement on the goals of treatment; and 3) a personal, affective bond between the patient and therapist. An alliance rupture is a deterioration in the alliance, manifested by a *lack of collaboration* between patient and therapist on tasks or goals, or a strain in the emotional bond (Eubanks-Carter et al., 2015; Bordin, 1979).

The coding system, which does not necessitate transcription, requires raters watch an entire videotaped therapeutic session in five-minute intervals to observe for instances of collaboration and/or tension between patient and therapist, determining whether a rupture, if present, can be categorized as a confrontation rupture or withdrawal (Coutinho, Ribeiro, Hill, & Safran, 2011). This measure has been shown to have high sensitivity in detecting ruptures compared to other methods, such as self-reports (Coutinho, Ribeiro, Sousa, & Safran, 2014; see Table 2 for breakdown of the various typologies of therapeutic ruptures and resolution strategies).

Beck Scale for Suicidal Ideation (SSI).

Often considered a gold standard in suicide risk assessment, the SSI is a clinician-rated scale, presented as a semi-structured interview. A study by Holi et al. (2005) evaluated the instrument's validity and found a Cronbach's alpha of .95 for the whole sample, where sensitivity was 75% and specificity was 88.9%, suggesting that the SSI is a reliable and valid measure to detect suicidal ideation.

Lifetime Parasuicide Count (LPC).

Linehan and Comtois (1996) developed a paradigm that characterizes and counts episodes of NSSI. While not considered a psychometric measure, the LPC count facilitates a semi-structured interview about the number of instances but does not generate a score related to severity or intensity.

Coding adverse events (AEs).

A doctoral trainee and a member of the RCT research team examined database records describing the participants consented into the study, identifying patients who had experienced an adverse event (AE) during the course of their treatment. The date and classification of the event was logged. AEs were classified by instances of suicidal behaviors or gestures, episodes of acute suicidal ideation, and reported occurrences of NSSI behavior. For the identified cases with AEs, psychotherapy sessions prior to AEs were coded in their entirety for therapeutic ruptures/resolutions, negative self-referential speech, and psychomotor agitation. Once all of the known sessions were identified and coded, the research team randomly selected subsequent sessions for coding. Additional AE were identified in the beginning portions of the sessions when the therapist and client reviewed the content on the diary cards. If an AE was identified to have occurred during the week, the research team assigned the session prior as a target session. All sessions included in the study were labeled via their AE type or characterized as a "non-event session" (i.e., no AE occurred prior to that session). To assure that non-event related sessions were properly labeled, the diary card entries of the subsequent sessions were also coded. In instances where the subsequent session referenced an AE in the diary card, this procedure was repeated, assigning the newly identified AE-related session to the group of AE type (e.g., suicide attempt, NSSI behavior, suicidal ideation).

Coding therapeutic rupture markers.

Graduate-level research assistants coded for therapeutic ruptures and therapist resolution strategies by utilizing the 3RS coding scheme (Eubanks-Carter, Muran & Safran, 2015). The head of the current study received comprehensive multi-day training on the 3RS with the authors of the coding scheme. All coders received in depth training that included group coding of actual therapy sessions, didactics on rupture types, as well as discussions about resolving inconsistent coding. During the training, interrater reliability approximated 80%.

Based on the coding paradigm, frequency counts of the various typologies of ruptures and resolutions are documented per five-minute interval of the session. During each five-minute interval, coders entered the presence or absence of ruptures in a digital coding sheet, a Microsoft Excel (2018) file that replicated the coding sheet provided by the 3RS authors (Eubanks-Carter et al., 2015). Due to the subtle nature of these in-session phenomena, coders were encouraged to watch and re-watch portions of the footage to evaluate nuanced and complex interactions, verbalizations and behavior. With the camera pointed toward the patient, subtle behavioral and facial cues allowed the coders to integrate utterances and visual input to determine whether a rupture had occurred. When certain rupture type occurred more than once within the five-minute interval, per the coding parameters, multiple occurrences were not reflected in the sheet; hence, the coder enters a "1" regardless or frequency. On the coding sheet, All occurrences were summed to create both a composite score of confrontation/withdrawal ruptures as well as a categorization of each individual type of rupture.

Throughout the coding process, interrater reliability was assessed to assure consistency and reduce systematic error. Randomized sessions were assigned to be re-coded by a colleague on the research team. In the event that inconsistencies arose, a third coder decided which codes

best fit the observed phenomena (see the section on Interrater Reliability for more details).

Coding and scoring negative self-talk content.

While coding therapeutic ruptures, researchers simultaneously logged instances of negative self-referential content during the course of the therapy session's five-minute intervals. Researchers provided both a frequency count of instances of the verbal content as well as verbatim quotations. The transcription of the negative self-referential speech was analyzed via software that provided ratings of emotion intensity associated with the linguistic content using The Linguistic Inquiry and Word Count software (LIWC2015; Pennebaker, Booth, Boyd & Francis, 2015). This program utilizes a reference group corpus of almost 6,400 words, word stems and emoticons that have been identified as being salient during affective states. Each word in the corpus has a corresponding entry that denotes which categories describe the semantic structure of the word, organizing them hierarchically (e.g., "sad" is an adjective and emotion word, emotion word is more salient). The software provides each emotionally salient word with an arousal score that has been demonstrated to be associated with brief affective states. Previous studies have identified that LIWC scores for verbal content correlate with Positive and Negative Affect States (PANAS; Waston, Clark & Tellegen, 1988) scores, a valid and reliable measure of self-reported affective states. When a sentence is entered for analysis, the software computes a "negative affect" score.

Coding psychomotor agitation.

While researchers code the verbal content explored above, additional attention was devoted to the patients' in-session physical behavior and demeanor. The coders marked the presence and duration (in seconds) of discrete instances of psychomotor agitation or purposeless movement within each five-minute interval of the therapy session. Discrete instances of

purposeless physical movement were marked per 5-minute interval. For more continuous behaviors (e.g., foot tapping, rocking, hand-wringing), coders logged this behavior once for each five-minute interval and timed the duration of the behavior in seconds.

Interrater reliability

To assure that study coders consistently and accurately identified in-session markers, the primary three coders independently coded the same randomized session. Agreement was conferred in instances where coders consistently identified the occurrence of in-session markers and consistently did not report an occurrence (i.e., the presence and absence of a code). The interrater reliability was considered for each five-minute interval within the session, crossed with each variable on the coding sheet. Three-way interrater reliability was calculated using Krippendorf's α, which provided an estimate of disagreement that accounts for the possibility of agreement by chance. While Krippendorf's α does not account for the varied base rates of certain codes, it is considered the most reliable measure of consistency with three or more coders (Hayes & Krippendorf, 2007). Krippendorf's α was calculated using the ReCal3 software (Frelon, 2010), a free online interface that computes interrater reliability coefficients for nominal variables (i.e., presence of a rupture event or not) by three coders. Based on the data comprised of three independent codings of the randomly assigned session, the calculated Krippendorf's α reliability coefficient was $\alpha = 0.85$. Per the convention suggested by Hayes and Krippendorf (2007), agreement of $\alpha \geq 0.80$ indicates that that standard of reliability has likely been met.

Data Analysis

Exploratory Analysis

The present study utilized a series of exploratory analyses designed to identify patterns and associations between coded in-session variables – withdrawal and confrontation rupture

markers, negative self-talk – and self-harm behavior. Since psychotherapy sessions are nested within individuals, multilevel modeling was utilized to properly account of the variability within individuals and across psychotherapy sessions.

Descriptive statistics.

Upon completion of data collection, descriptive statistics were computed to understand which rupture markers, withdrawal and confrontation, occurred most often across the sample. A visual analysis of graphs and histograms informed how variables manifested over the course of sessions to inform subsequent analyses. The descriptive statistics were calculated at both the general level (e.g., frequency of any withdrawal rupture, frequency of any confrontation rupture) and at the granular level (e.g., frequency of individual types of withdrawal markers, frequency of individual types of confrontation ruptures). These descriptives informed which covariates were included in the subsequent models. Subtypes of withdrawal and confrontation ruptures that did not manifest in the coded sessions were dropped.

Mean comparison: Paired *t* tests.

To help determine which predictor variables may be relevant for multilevel modeling, a paired *t* test was used to compare sessions prior to an adverse event (i.e., suicide attempt, NSSI, NSSI urges, suicidal ideation) to matched sessions that did not precede adverse events. Since this analysis does not account for within subject and repeated entries, *t* tests cannot entirely control for participant factors that may also contribute to the phenomena of interest. Subsequent analyses are designed to account for this limitation. The paired *t* tests allowed for a partial accounting for within-subject variability, since each entry compared mean values for the same variable in the same participant, in sessions prior to an AE and non-event sessions. Each analysis used a two-tailed alternative hypothesis (H_1), assuming that the estimated mean

difference (μ_d) between the session prior to an adverse event and the non-event session value is not equal to zero.

H_0: $\mu_d = 0$

H_1: $\mu_d \neq 0$

All in-session markers are reported as continuous variables. The analysis assumes that the participant characteristics are homogenous or the sample data is not independently sourced. Each variable met the assumption of normality via the Anderson-Darling Test of Normality (Anderson & Darling, 1952). In this test, rejecting the null hypothesis suggests that the data does not derive from a normally distributed population. Since the data collected in the sample is collected per session, some of the participants who engaged in multiple instances of the same adverse event were included in the analysis several times.

Multilevel modeling.

A general linear modeling (GLM) approach to exploratory model building – more specifically, logistic multilevel modeling – sought to identify in-session factors that were associated with adverse events in the subsequent session. Sessions were grouped by patient, as such a multi-level structure was needed to account for the within and between subject variability. Level 1 included session variables, such as rupture markers, resolution strategies, negative self-talk and psychomotor agitation. Level 2 included patient variables reported at baseline, such as demographic characteristics and history of self-harm behaviors. To confirm that multilevel modeling was appropriate for the structure of the data, an interclass correlation (ICC) was calculated for each outcome of interest (i.e., suicide attempt, NSSI and suicidal ideation). High ICC values demonstrated that the between-group variance contributed to the within-group variance, suggesting that the differences that are seen across sessions may be driven by patient

characteristics. Intercept-only models were fitted with the random intercept nesting term, denoting that sessions were nested within participants. Significance testing of the intercept model determined whether the addition of the nested variable explained some variance of the occurrence of the outcome. Based on the data derived from the descriptive statistics, paired *t* tests and LPA, variables were added to the model as fixed effects and iteratively compared to the intercept-only model. Each multilevel analysis utilized Full Information Maximum Likelihood (FIML), which allows for likelihood ratio tests to compare models.

$$\log\left(\frac{P(NSSI = 1)}{1 - \Pr(NSSI = 1)}\right) = \beta_0 + \beta_1 x_{ij} + u_j$$

Model fit statistics were used to determine which model, and covariates, best explain the occurrence of adverse events during DBT treatment.

All analyses were run using the R Studio (R Development Core Team, 2012) statistical package *lme4* (Bates, Martin, Bolker & Walker, 2015), which are designed to account for multi-level modeling with a general linear model and a dichotomous outcome (logit). The software permits the construction of a model that accounts for multilevel data organization, and allows for additional covariates at each level (i.e., Level 1 and Level 2).

Latent profile analysis.

With multiple variables of interest, the combination of manifestations and absences of a phenomenon may be clinically relevant. A latent profile analysis (LPA) explores whether apparently homogeneous samples can be divided into two or more sub-groups that share common traits or latent constructs. These latent constructs can shed light on unmeasured factors that help explain the phenomena. Unlike a Latent Class Analysis (LCA), which requires categorical variables, the LPA technique allows an examination of the structure of continuous variables.

The open source statistical software R (R Core Team, 2012) was utilized with the *tidyLPA* package (Rosenberg, Beymer & Schmidt, 2018) to run the analyses. For the current sample, the LPA analysis determined the likelihood of each session being assigned to one of these classes and a respective latent construct, simply put; the method differentiates types of sessions based on the in-session markers. With each session being assigned to a single class membership, the pattern of in-session markers can provide information regarding how session characteristics cluster together. Iteratively, the in-session data is fitted to a selected number of solutions, meaning that the statistical procedure must assign each session to a respective profile. For the current analysis, two through seven profile solutions were fitted. Based on model fit statistics (e.g., *AIC*, *BIC*), the number of profiles that best fit the data from a probabilistic and theoretical standpoint were selected. Once the analysis determined the best fitting assignment of profiles, a post-hoc examination assessed the type of sessions preceding adverse events. Based on the frequency of in-session markers within each profile, a qualitative analysis of the "session type" allowed for the identification of an unmeasured latent construct that described session characteristics. With this exploration of the prevalence of Level 1 variables, a visual analysis of the distribution of sessions and mean frequencies of measured variables provided additional information regarding which in-session markers were relevant as a supplemental analysis in conjunction with the GLM approach. All results should be interpreted with caution since LPA does not account for nested data.

Results

Frequency of Adverse Events

During the opening minutes of each session, the therapist requested to review the patient's diary card, which provided an accounting of the past week's adverse events and skills to

mitigate these behaviors. Within the 98 coded sessions, at total of 61 adverse events were recorded, which including incidents of NSSI behavior, NSSI urges, suicide attempts and suicidal ideation. For sessions that had multiple reported adverse events, the most severe event was entered into the respective analyses.

Suicide Attempts.

Across the coded sessions, there were a total of ten suicide attempts via intentional overdose by five participants (24% of the sample; see Table 8 and 11).

Non-suicidal Self Injury.

Across the coded sessions, 36% of the sample reported at least one NSSI behavior on their diary card. These behaviors included superficially cutting their body, hitting themselves in the head and self-induced vomiting (see Table 9).

Non-suicidal Self Injury Urges.

Across the coded sessions, there were 16 reported episodes of NSSI urges by seven individuals in the study (32% of the sample; see Table 9).

Suicidal Ideation.

Across the coded sessions, there were 22 reported episodes of suicidal ideation across 13 individuals (59% of the sample; see Table 10).

Withdrawal ruptures.

Each coded session included at least one type of withdrawal rupture. The four most common withdrawal ruptures, which are included in subsequent analyses, are deferential and appeasing (81% of coded sessions), content/affect split (92% of coded sessions), abstract communication (71% of coded sessions) and minimal response (66% of coded sessions). Average frequencies and standard deviations are provided in Table 13. See the operationalization

of the selected variables below as defined by the coding scheme (Eubanks-Carter, Muran & Safran, 2015):

Deferential and appeasing (Defer).

A deferential rupture is one in which the "patient withdraws from the therapist and/or the work of therapy by being overly compliant and submitting to the therapist in a deferential manner. The patient's deferential behavior functions to avoid conflict with the therapist, and/or makes it harder for the therapist to know how the patient really feels or what the patient really thinks" (Eubanks-Carter, Muran & Safran, 2015, Supplemental Materials, p. 1).

Content/affect split (Split).

"The patient withdraws from the therapist and/or the work of therapy by exhibiting affect that does not match the content of his/her narrative" (Eubanks-Carter, Muran & Safran, 2015, Supplemental Materials, p. 2)

Minimal response (MinResp).

"Patient withdraws from the therapist by going silent or by giving minimal responses to questions or statements that are intended to initiate or continue discussion. The patient's minimal responses function to shut down the therapist's attempts to engage the patient in the work of therapy" (Eubanks-Carter, Muran & Safran, 2015, Supplemental Materials, p. 1).

Abstract communication (Abst).

"Patient avoids the work of therapy by using vague or abstract language. The patient's use of abstract language functions to keep the therapist at a distance from the patient's true feelings, concerns, or issues. The patient may intellectualize or make global statements rather than directly stating his/her true thoughts or feelings" (Eubanks-Carter, Muran & Safran, 2015, Supplemental Materials, p. 1).

Confrontation ruptures.

Confrontation ruptures were slightly less prevalent compared to withdrawal ruptures, manifesting in 80% of coded sessions. The most frequent confrontation rupture was coded in instances when the participant defended themselves against the therapist during interactions, occurring at least once in 80% of coded sessions. Average frequencies and standard deviations are provided in Table 13.

Patient defend self against therapist (Defend).

"Patient defends his/her thoughts, feelings, or behavior against what he/she perceives to be the therapist's criticism or judgment of the patient. The patient makes a case to support, validate, and defend his/her behavior, beliefs, feelings, decisions, etc. Note that the therapist does not have to actually criticize the patient for the patient to anticipate or perceive criticism and become defensive" (Eubanks-Carter, Muran & Safran, 2015, Supplemental Materials, p. 3).

Negative self-talk.

Instances of negative self-talk occurred at least once in just under a third of the coded sessions (28%). Average frequencies, standard deviations and LIWC linguistic analysis scores are provided in Table 13.

Agitation.

Physical agitation in session proved to be a rare phenomenon. Across the coded sessions, only three discrete instances of agitation manifested in session (3% of coded sessions). Average frequencies and standard deviations are provided in Table 13.

Latent profile analysis of in-session markers (Level 1)

The LPA included variables that were the most frequently coded during the course of the study. The selected variables included Defer (Defer), Content/affect split (Split), Minimal

Response (MinResp), Abstract Communication (Abst), negative self-talk (NegSelf) and Defend (Defend). Fit statistics were computed for two to seven profile solutions. While the six-profile solution demonstrated the best fit statistically (*AIC* = 2229.9; *BIC* = 2351.87), one of these profiles only had two assigned sessions. Based on the recommendations from Jason and Glenwick (2016) profiles with fewer than 10 objects may be spurious or invalid. When considering the fit statistics and the conceptual understanding of the in-session data, the five-profile solution (*AIC* = 2261.66; *BIC* = 2365.47) demonstrated the best fit (Ed. Jason & Glenwick, 2016; see Table 15 for additional fit statistics for each fitted solution). The outcome of the LPA will be discussed below with relation to the associated adverse events within each profile (see Figure 1 for a visualization of the five-profile solution, with included mean frequencies of the selected Level 1 variables).

Based on a visual inspection of the relative frequencies of the included variables, latent constructs were identified by considering the clinical presentation associated with each profile. The latent constructs were named in collaboration with a clinical psychologist involved in the research project who described relational characteristics that are consistent with the visualization of the profiles (Figure 1). Following the LPA analysis, random sessions from each profile were viewed again by the researcher to examine the interactions between the client and therapist. Particular attention was paid to the manner, and function, in which the elevated in-session markers contribute to the client's approach to the therapist. Based on the session viewings and the visual analysis of each profile, the titles of each latent profile sought to characterize the "type" of session. Latent constructs describing the sessions included: Aggressive Distancing (Profile 2; *n* = 11), Indirect Hostility (Profile 3; *n* = 12), Internalized Aggression (Profile 4; *n* =

10) and Acquiescent (Profile 5; *n* = 15). The underlying construct of the first profile was not easily interpretable, and therefore remained unnamed (Profile 1; *n* = 50),

Profile 1: Unnamed.

Profile 1 (*n* = 50), currently Unnamed, is comprised of the lowest mean frequencies of in-session markers across the fitted profiles. The mean frequencies of the in-session markers, relative to one another, show an elevation in Split; however, the Unnamed profile has the lowest mean values of Abst, Defend, Defer and MinResp. The Unnamed profile has the most sessions (*n* = 50; 51%) of all the fitted profiles. Secondary to the large number of sessions assigned to this profile, the error bars for the in-session markers are among the narrowest of the LPA profiles. Based on the limited observed occurrences of ruptures, it would appear that the therapist and client are allied in these sessions, however the infrequency of ruptures may also suggest a potential attitude of compliance on the patient's part.

Profile 2: Aggressive Distancing.

Profile 2 (*n* = 11) is characterized by the highest mean frequency of the Defend variable. In this profile, clients confronted their therapists in a defensive manner, suggesting that they felt impinged upon due to the therapist transgressing or overstepping a self-imposed boundary. When the therapist attempted to address these ruptures, the client provided limited verbal input and exhibited limited willingness or capacity to take accountability for their contribution to the rupture.

Profile 3: Indirect Hostility.

Profile 3 (*n* = 12) is characterized by the highest mean frequency of MinResp, Abst and Defer. Across the fitted profiles, Profile 3 had the highest frequencies of withdrawal ruptures. The profile has the highest elevation in MinResp and Abst. In this profile, clients used their

language, or lack thereof, to communicate distance or to withhold from the therapist. In this profile, the client often answered with "yes/no" answers that provide little additional context or information. The clients in these sessions also exhibit more deference to the therapist, which may serve to appease the therapist rather than to communicate clearly or to establish closeness. Instead of confronting their therapist about the limited ability or willingness to engage in activities of therapy, the sessions in this profile demonstrate strategies of withholding that are more passive. These sessions typically require the therapist to be more active, making strides to "pull" information from the client in a more directive manner.

Profile 4: Internalized Aggression.

Profile 4 (n = 10) is characterized by elevated mean frequencies in Split, MinResp and NegSelf. This profile had the highest mean frequency of negative self-talk by more than three standard deviations. In the sessions fitted to this profile, the clients have a pronounced difficulty in modulating their affect in session (affectively incongruent), but also exhibit limited verbal expression of their internal experience. When they are verbalizing their experience, it tends to be more negatively valenced and directed towards the self, endorsing feelings of worthlessness and self-blame.

Profile 5: Acquiescent.

Profile 5 (n = 15) is characterized by the most dramatic differences in relative mean frequencies of in-session markers. The sessions fitted to this profile have the highest mean frequency of Split coupled with the smallest mean frequency of negative self-talk. While there is substantial incongruence between affect and content, the clients are more verbally expressive. Clients avoid conflict and discord by engaging in deferential behavior and speech, which may suggest difficulty tolerating negative affective experience. By avoiding disagreement and

conflict with the therapist, the client seeks to appease the therapist and minimize their distressing experiences. The clients in this group may be more likely to idealize their therapist.

In-session markers associated with non-suicidal self injury

Mean comparison: Paired *t* tests.

When examining paired *t* tests comparing sessions prior to reported incidents of NSSI to randomly selected non-event sessions, three coded types of withdrawal variables ($t(12) = 4.03$, $p < .01$) were significantly associated with NSSI, namely: deferential behavior ($t(12) = 2.25$, $p < .05$), content/affect split ($t(12) = 3.25$, $p < .05$) and minimal response ($t(12) = 2.71$, $p < .05$; see Table 14 for all *t* tests).

Latent profile analysis.

The majority of NSSI events were associated with sessions that manifested internalized aggression (Profile 4; $n = 6$, 46%). In comparison, NSSI behavior occurred less frequently in all other profiles: Unnamed profile (Profile 1; $n = 4$, 30%), the Aggressive Distancing profile (Profile 2; $n = 1$, 7%), the Acquiescent profile (Profile 5; $n = 1$, 7%) and the Indirect Hostility profile (Profile 3; $n = 1$, 7%).

Multilevel modeling.

To model the associations between in-session variables and NSSI, a generalized linear mixed effects analysis was utilized. Due to the hierarchical structure of the data (sessions nested within individuals), participants were entered into the model as random effect. To confirm that a multilevel analysis was appropriate when building a model to explain NSSI, an interclass correlation (ICC) was calculated. The ICC value of 0.588, suggests that a large amount of variability can be accounted for by the nested structure of the data. Per the recommendations for model building proposed by Snijders and Bosker (2011), an intercept-only model was fitted with

the random nesting variable with FIML estimation. As fixed effects, variables that appeared relevant conceptually and clinically were entered one by one. Each iterative model was tested using a likelihood ratio test, in this case a χ^2 test, to compare the proposed model with an intercept model that included the nested factor. Variables with significant correlations were not entered into the same model when testing fitness. Inter-level and intra-level interactions were also added to the model and fitness was determined. The final model included fixed effects coded variables on level 1 "Split" ($\beta = .30$, $p < .05$), denoting content/affect split, and level 2 variable "LIFESIB" ($\beta = .39$, $p < .21$), denoting the frequency of lifetime episodes of NSSI, without interaction terms. The model equation, presented in the combined form, is provided below (see Table 17 for model estimates).

$$\log\left(\frac{P(NSSI = 1)}{1 - \Pr(NSSI = 1)}\right) = \beta_0 + \beta_1 Split_{ij} + \beta_2 LIFESIB_{ij} + +u_j$$

Significance levels and model fit statistics informed the model of best fit. The full model that included the relevant predictor variables significantly explained more variability than the intercept model ($\chi^2 = 6.68$, $p < .05$) that included the nested term (see Table 18 for model comparison). Visual inspection of residual plots did not reveal any obvious deviations from homoscedasticity or normality that would violate assumptions. There were no noted outliers or missing data that may contribute to random or systematic error.

The proposed model utilizes both Level 1 and Level 2 fixed effect variables to examine the relationship between in-session markers and NSSI. When controlling for the frequency of lifetime NSSI ("LIFESIB"), the log-odds of subsequent NSSI behavior increased by 36% for each occurrence of content/affect split in-session ("Split").

In-session markers associated with suicide attempts

Mean comparison: Paired t tests.

When examining paired *t* tests comparing sessions prior to reported incidents of suicide attempts to non-event sessions, no coded variables were significantly associated (see Table 14 for all *t* tests).

Latent profile analysis.

The majority of reported suicide attempts (*n* = 7; 70%) in the sample occurred during sessions that were fit into the Unnamed profile (Profile 1). The remaining suicide attempts manifested with sessions in the Aggressive Distancing profile (Profile 2; *n* = 2, 20%) and Indirect Hostility (Profile 3; *n* = 1, 10%). There were no suicide attempts in the other two profiles: Internalized Aggression (Profile 4) and Acquiescent (Profile 5).

Multilevel modeling.

To model the associations between in-session variables and suicide attempts, a generalized linear mixed effects analysis was utilized following the same procedure as the prior analysis for NSSI. Here, the ICC value was .416, suggesting that a large amount of variability was accounted for by the nested structure. Per the recommendations for model building proposed by Snijders and Bosker (2011), an intercept only model was fitted with the random nesting variable. As fixed effects, variables that appeared relevant conceptually and clinically were entered one at a time as fixed effects and estimated by FIML. Each iterative model was tested using a likelihood ratio test, in this case a χ^2 test, to compare the proposed model with an intercept model that included the nested factor. Variables with significant correlations were not entered into the same model when testing fitness. Inter-level and intra-level interactions were also added to the model and fitness was determined. The final model included fixed effects

coded variables on level 1 "WD" (β = -.13, $p > .05$), denoting total frequency of withdrawal ruptures, and "CON" (β = .39, $p > .05$), denoting the total frequency of confrontation ruptures, with total number of lifetime suicide attempts "Tot_SA_all" on level 2 (β = 1.12, $p < .05$), without interaction terms. The model equation, presented in the combined form, is provided below (see Table 19 for model estimates).

$$\log\left(\frac{P(SA=1)}{1-\Pr(SA=1)}\right) = \beta_0 + \beta_1 WD_{ij} + \beta_2 CON_{ij} + \beta_3 Tot\_SA\_all_{ij} + u_j$$

Significance levels and model fit statistics informed the model of best fit. The full model that included the relevant predictor variables significantly explained more variability than the intercept model that included the nested term ($\chi^2 = 10.13$, $p < .05$), despite the overall model not approaching statistical significance (see Table 20 for model comparison). Visual inspection of residual plots did not reveal any obvious deviations from homoscedasticity or normality that would violate assumptions. There were no noted outliers or missing data that may contribute to random or systematic error.

The proposed model utilized both Level 1 and Level 2 fixed effect variables to examine the relationship between in-session markers and suicide attempts. When controlling for the number of past suicide attempts, the frequency of total withdrawal ruptures ("WD") and confrontation ruptures ("CON") was not significantly associated with suicide attempt prior to the following session.

In-session markers associated with suicidal ideation

Mean comparison: Paired *t* tests.

When examining paired *t* tests comparing sessions prior to reported incidents of suicidal ideation to non-event sessions, elevations in deferential behavior ($t(21) = 2.06$, $p < .05$) and content/affect split ($t(21) = 2.03$, $p < .05$) were associated with SI (see Table 14 for all *t* tests).

Latent profile analysis.

The reported episodes of suicidal ideation occurred across all of the profiles, with the majority in the Unnamed profile (n = 10; 45%). The Acquiescent profile (Profile 5; n = 5, 23%) appeared to have some specificity for suicidal ideation since there were no hits in the non-event or suicide attempt categories. The remaining episodes of suicidal ideation were associated with the Aggressive Distancing profile (Profile 2; n = 2, 9%) and Indirect Hostility profile (Profile 3; n = 2, 9%).

Multilevel modeling.

With an ICC value of .075, multilevel modeling was not appropriate for suicidal ideation in this sample.

In-session markers associated with non-suicidal self-injury urges

Mean comparison: Paired *t* tests.

When examining paired t tests comparing sessions prior to reported incidents of NSSI urges to non-event sessions, only elevations in minimal response ($t(15) = 2.19$, $p < .05$) was associated with NSSI urges (see Table 14 for all t tests).

In-session markers associated with no adverse events

Latent profile analysis.

The majority of sessions not associated with an adverse event were fitted into the Unnamed profile (n = 23, 77%). The remaining sessions were equally distributed across three profiles: Aggressive Distancing (Profile 2), Indirect Hostility (Profile 3) and Internalized Aggression (Profile 4), (n = 1; 3%). All sessions assigned to the Acquiescent profile had an associated adverse event, reported suicidal ideation or NSSI behavior.

Discussion

The current exploratory study sought to identify in-session markers that occurred in the session prior to an adverse event – suicide attempts, NSSI behavior or suicidal ideation. Sessions were coded for withdrawal and confrontation rupture markers, negative self-talk, and agitation. The included sample, screened for clinical acuteness in terms of self-harm behavior, engaged in AEs at a higher frequency than the general population. As an exploratory study, specific hypotheses were withheld and each in-session marker was investigated to test its potential role in subsequent AEs.

When controlling for the number of lifetime NSSI episodes, elevations in content/affect split predicted subsequent NSSI behavior prior to the following therapy session. For each instance of content/affect split, the log-odds of subsequent near-term NSSI behavior increased by 36%. When examining in-session factors related to suicide attempts, no significant associations were found. When controlling for past suicide attempts, total withdrawal and confrontation ruptures did not predict suicidal behavior prior to the following session. Since prior self-harm behavior is one of the best-known predictors of future self-harm behavior (e.g., Franklin et al., 2017), each model controlled for past suicide attempts and NSSI in their respective analyses. This is the first study to our knowledge that has identified an observable behavior in-session that was associated with subsequent self-harm.

To explore the relative heterogeneity of the mean frequencies of in-session factors, the sample of therapy sessions can be categorized in to five distinct "types," or profiles. These profiles are named via the latent construct which described the manner in which the client approached the therapist. These included: Unnamed (Profile 1), Aggressive Distancing (Profile 2), Indirect Hostility (Profile 3), Internalized Aggression (Profile 4), and Acquiescent (Profile 5).

While the initial LPA analysis was blinded to AEs, a post-analysis audit found that NSSI and suicidal ideation generally clustered together in profiles associated with elevations in in-session markers. Meanwhile, suicide attempts manifested in the profiles with some of the lowest mean frequency of in-session factors, appearing to not be differentiated from non-AE related sessions.

Therapeutic alliance and rupture markers in DBT

Psychotherapy research, spanning decades, has highlighted the essential link between therapeutic alliance and outcome (e.g., Norcross, 2002). This literature posits that stronger therapeutic alliances would yield better outcomes, including in DBT treatment. Utilizing a naturalistic evaluation of DBT for BPD clients, Turner (2000) found that the quality of the therapeutic alliance explained a substantial proportion of variance in the outcome of treatment. When conceptualizing ruptures in therapeutic alliance, it is important to acknowledge their dyadic and co-constructed nature. In the current study, however, the therapist's role or contribution to the rupture is not accounted for via the coding scheme. As previously discussed, DBT therapists leverage an irreverent and matter-of-fact tone during sessions, which may inadvertently inspire a rupture. This is potentially an important consideration when examining the nature of ruptures within DBT treatment specifically.

Despite the integral nature of therapeutic alliance in therapy outcomes across modalities, there are few studies that have used an observer-based methodology to examine therapeutic alliance within DBT treatment. While an exact comparison between rates of rupture between DBT and other modalities of treatment is not possible, the sample included in this study exhibited large mean frequencies of a vast array of rupture types. While the current study did not account for therapist resolution strategies or the varying intensity of ruptures, the findings align with previous studies that utilized DBT samples. A recent study that utilized the 3RS coding

scheme (Eubanks-Carter et al., 2015) found that therapeutic ruptures and therapist's attempts at resolving these moments of discordance early in treatment were associated with the recovery status of the client at the end of treatment (Boritz et al., 2018). While ruptures occurred frequently for both recovered and unrecovered clients, the frequency of withdrawal ruptures was higher in unrecovered clients compared to those who were identified as "recovered." The frequency of the therapist attempts to repair these ruptures did not differ between recovered and unrecovered patients; however, the resolution strategies of the recovered clients appeared to be more impactful for the overall treatment. Additionally, another recent study by Yaseen, Galynker, Cohen and Briggs (2017) identified self-reported therapist factors that were associated with subsequent suicidal behavior. The anonymous reporting of first year psychiatry residents was examined in relation to participant clinical and demographic factors post-discharge from a psychiatric inpatient unit. The study found that the psychiatry residents who manifested conflicting emotional responses, alternating between distress and hopefulness, had clients with more frequent suicidal behavior at follow-up. As a client approaches a suicide crisis, the therapist is tasked with maintaining the therapeutic relationship while experiencing intense countertransference. The study illustrated the importance of therapeutic alliance, particularly in the intersubjective experiences.

Studies have showcased a complex relationship between therapeutic alliance and NSSI behaviors. When looking at particular components of alliance, DBT clients who perceived their therapist as affirming and protecting exhibited fewer episodes of NSSI behavior. In a study by Bedics et al. (2012), the authors examined self-reported therapeutic alliance within DBT treatment and a treatment-by-experts condition. In the DBT group, an increase in therapeutic alliance, as reported by both clients and therapists, was associated with significant reductions in

suicide attempts (Bedics et al., 2015). In regards to NSSI, client-rated alliance reduced NSSI behavior by 16% for each unit increase of alliance score. In the treatment-by-experts group, however, NSSI increased by 33% for each unit of therapist-rated alliance. The authors hypothesized that DBT therapists leverage the therapeutic alliance in a different way compared to other treatment modalities. DBT therapists may employ aspects of the therapeutic relationship (e.g., affirmation, guidance and positive regard) with the intention of reinforcing reductions in NSSI behavior. Additionally, therapeutic alliance in DBT may be enhanced by an intentional framing of the therapy with several dialectics – acceptance and change, autonomy and control, loving and challenging – that positions the therapist to engage with the client in a manner that reduces the likelihood of power struggles, ultimatums and mutual resentment. In this study, the authors postulated that for the treatment-by-experts group, aspects of the alliance may have positively reinforced the NSSI behavior because the therapist modulated their attentiveness and concern in a counterproductive manner. The irreverent, matter of fact tone that is characteristic of DBT treatment may facilitate therapeutic bond while not inadvertently reinforcing therapy interfering behaviors.

Client factors in the alliance.

When examining client factors in the therapeutic dyad, Agreeableness, a personality trait characterized by kindness, warmth and compassion, was associated with positive outcome in therapy treating BPD samples (Hirsh et al., 2012). Therapists rated particular personality characteristics of their clients that predicted the development and maintenance of the therapeutic alliance. Over the span of a one-year intervention, a mediation analysis found that client Agreeableness was associated with increased working alliance, which in turn predicted improved treatment outcomes. In the current study, the construct of deference was examined in the

framework of a therapeutic rupture marker. If deference is considered to be an extreme form of agreeableness, the current findings related to the LPA analysis found a qualitative association with deference and suicidal ideation (Profile 3: Indirect Hostility; Profile 5: Acquiescent). Additionally, when using the mean comparison approach (Paired *t* test), deference was significantly associated with suicidal ideation and NSSI behavior. However, the relationship between deference and suicidal ideation and NSSI behavior was not found when building the multilevel model. In one of the definitive papers about the topic, Rennie (1994) conducted a systematic appraisal of deference by viewing therapist-submitted video or audio content to determine the functions of client deference in therapy. This grounded theory study found that clients sought to convey that they were "good patients," felt concerned about the therapist's clinical approach, and were anxious about criticizing the therapist. Deference often manifested following instances of negative self-talk when the therapist gently challenged their self-appraisals. Instead of confronting the therapist about their maintained derogatory thoughts and beliefs, the client acquiesces to the therapist's intervention, often to avoid conflict. While it is not possible to confirm, clients who are deferential in session with their therapist are likely deferential in their everyday life, which may contribute to feelings of powerlessness, lack of agency and an external locus of control.

The finding in this study that certain types of withdrawal ruptures are related to AEs is consistent with other work that has found client disengagement and "moving away" from the therapist to be related to poorer therapy outcomes. A study surveying DBT therapists on working with challenging behavior in the context of treatment found that observed patient avoidance and disengagement was associated with double the risk of self-directed violence (Chalker et al., 2015). Since the study did not prospectively examine these factors with relation to self-harm, the

directionality of the association between patient avoidance/disengagement and self-harm cannot be determined. Subsequent analyses found that intentionally utilizing phone coaching to improve engagement was associated with treatment adherence and client satisfaction. While the constructs of "avoidance" and "disengagement" may resemble withdrawal ruptures, the study did not approach the data prospectively. The foregoing understanding of client's deference leads to the implication that attempts by therapists to recognize and deal with clients' unspoken appraisals, especially when negative, might strengthen the working alliance and possibly improve the outcome of therapy.

Emotional regulation and flexibility

The current study identified the rupture marker of content/affect split as associated with AEs during DBT treatment. As described by Linehan (2015, p. 323), "emotional regulation is the ability to control or influence which emotions you have, when you have them, and how you experience them." Emotions are neither good nor bad; they serve a function to communicate information to the experiencer and those in their relational network. While frequently noted in mental status examinations as "incongruent affect" there are few empirical studies that have explicitly examined this phenomenon. However, there is evidence that modulating of facial expression and mood states is an adaptive part of coping and managing distress. DBT dedicates an entire module in "emotional regulation," which focuses on ways individuals can modify the intensity of distressing emotions in order to navigate effectively through them (Linehan, 2015).

Emotional flexibility, or the ability to modulate emotional expression in order to adapt to contextual challenges, may be a relative deficit among individuals who engage in NSSI. Flexible emotion regulation, as proposed by Bonanno and Burton (2013), manifests in three sequential components: (1) appraising the context and determining their demands, (2) employing emotion

regulation strategies, and (3) ongoing encoding of explicit and implicit interpersonal feedback on the elected emotional regulation strategy. When examining the long-term impact of emotional flexibility, a laboratory-based study tested three conditions related to emotional evocative images, which included natural responding, enhanced facial expressions aligned with the content and suppressed facial expression. Participants who were able to both effectively enhance and suppress their facial expressions demonstrated reduced distress related to depression and anxiety at follow up, while participants who were better at only one of the conditions showed no change in distress at follow up (Bonanno et al., 2004). Clients in the current study may exhibit an impaired ability to appropriately suppress and enhance as they are discussing emotionally evocative content. Another study using a similar paradigm found an interaction between emotional flexibility and context sensitivity such that emotional flexibility predicted decreased anxiety and depression symptoms when context sensitivity was low but was not significantly associated to anxiety or depression symptoms when context sensitivity was high (Southward & Cheavens, 2017). The clients in the study who engaged in subsequent NSSI may have difficulty both enhancing and suppressing emotions when appropriate. Paralleling the notion of flexibility, a study utilized Facial Action Coding System (FACS) to code ruptures in psychotherapy. The study found that withdrawal ruptures were associated with expressions of Joy, Social Smile and positive emotional valence (Barros Vergara, Altimir & Pérez, 2016). The authors interpreted this finding as the client's attempt to safeguard the bond with the therapist, while engaging in some conflict. In the context of the current study, however, the FACS coding may have picked up on aspects of content/affect split, which is characterized as a type of withdrawal rupture. It is not clear whether any of the sessions in that study were prior to AEs.

Non-suicidal self injury

The factors that contribute to the onset of NSSI behavior are multifaceted and likely include a complex interplay between contextual factors, modulations in the nervous system and differential behavioral patterns. Despite clients describing NSSI behavior as being "impulsive" and occurring due to rapidly "losing control," adults who engage in NSSI behavior do not perform differently than healthy controls in tasks that test impulsivity (Allen & Hooley, 2017). Adults with a history of NSSI exhibited deficits in response inhibition, specifically when presented with negative affective stimuli (Allen & Hooley, 2018). The current study may capture an aspect of the client's clinical presentation that underlies this phenomenon. As a vulnerability factor, the client's conflicted and incongruent mood states, identified in this study as content/affect split, may serve as a behavior precursor to NSSI. Content/affect split may be a helpful proxy for emotional instability, as the client exhibits difficulty modulating their affective experience as it oscillates across multiple emotional states. As this expression manifests in session, this emotional tumult can be managed therapeutically with the assistance of the therapist. However, in contexts without additional support and limited ability to manage affective instability, the client may have a lower threshold of impulse control and subsequently engage in NSSI behavior.

Since the onset of NSSI occurs rapidly and outside the therapy office, researchers have had to use in vivo methods to assess the factors that predict NSSI within the hours, minutes and seconds prior to initiation of the behavior. Using ecological momentary assessment for seven days with BPD participants, Ammerman and colleagues (2017) examined negative affect, aggressive urges, impulsive urges, self-harm urges and levels of distress tolerance. The daily experience of negative affect was not found to be related to NSSI. The authors interpreted this to

mean that the participants may have habituated to frequent negative emotions. Urges to hurt oneself and impulsive urges predicted NSSI as well as lower levels of distress tolerance. Meanwhile, another EMA study comparing individuals who engage in NSSI with healthy controls found that the NSSI group reported significantly more "affective instability" during the course of their day (Santangelo et al., 2017, p. 1433). Another EMA study found that high levels of negative emotion prospectively predicted an increased likelihood of engaging in NSSI in the next time interval of the assessment (Houben et al., 2017). The study went on to find that following episodes of NSSI, participants reported increases in negative emotions and decreases in positive emotion, which also predicted an additional increase in negative emotions in the next measured time interval.

While the current study did not find a strong association between instances of negative self talk and NSSI, some studies have identified a relationship. A prospective study that utilized both explicit (i.e., questionnaires, validated assessments) and implicit factors (i.e., images associated with NSSI) associated with NSSI to determine what factors predict subsequent NSSI at follow up. The study found that diminished aversion to NSSI related stimuli and self-criticism significantly predicted NSSI four weeks later (Fox et al., 2018). While in the current study, in-session occurrences of negative self-talk were not significantly associated with NSSI behavior in mean comparison (Paired *t* test) or multilevel modeling, there was a qualitative relationship in the LPA since the group with the modal NSSI behavior had the highest mean frequency of negative self-talk. The onset of the emotional instability was often followed by a minimal response or deferential rupture.

On the whole, existing research studying factors associated with NSSI behavior have identified that these individuals experience challenges relating to emotions and emotionally

evocative content. A study comparing undergraduate students with and without NSSI behavior found that the NSSI group exhibited lower levels of response latency, intense emotions and difficulty continuing arduous or boring tasks. Of particular note, this group also reported significantly greater difficulty with emotion regulation (Maxfield & Pepper, 2018).

Researchers conducting EMA studies have found "affective instability" (Santangelo et al., 2017, p. 1433), high levels of negative emotion (Houben et al., 2017) and negative affect (Ammerman et al., 2017) to be strongly associated with NSSI behavior. A comprehensive review that explored the various functions of NSSI to regulate emotion identified five distinct types: avoidance of more distressing outcomes, influence their social environment, shift their attention, alter cognitions about the self, and induce physiological effect to the nervous system (McKenzie & Gross, 2014). Clients suffering from BPD endorsed similar reasons for NSSI after engaging in the behavior and describing their decision making (Brown, Comtois & Linehan, 2002). The current study provides an additional link identifying emotional instability as a predictor of near-term NSSI behavior, particularly when confronted with evocative stimuli and limited ability to either suppress or enhance affective state, resulting in fluctuations across affective states. Whether content/affect split is an associated factor or a cause remains unclear; however, in this study it appears to be a sensitive and specific marker that identifies individuals at near-term risk.

Suicide attempts

The current study did not identify any observable in-session factors associated with subsequent suicide attempts. When controlling for the number of past suicide attempts, there was no association between the frequency of withdrawal ruptures, confrontation ruptures, negative self talk or agitation. In fact, the secondary LPA profiles failed to distinguish sessions prior to

suicide attempts from non-AE sessions. The sessions prior to suicide attempts had some of the lowest mean frequency of rupture markers across the study.

Much research has associated trait impulsivity with individuals who attempt suicide (see Mann, Christine, Gretchen, Kevin, 1999). However, growing evidence is beginning to loosen the association between impulsiveness as a direct explanation of suicidal behavior. Instead, more time proximal factors may better account for the behavior. Millner and colleagues (2018) compared suicide attempters with suicide ideators on several dimensions of impulsiveness, finding no difference between these groups. However, inpatients who had made suicide attempts within the past two weeks endorsed higher levels of negative urgency, a component of impulsivity associated with negative emotional states. This pattern was not found among outpatient attempters with more distal suicide attempts (Millner et al., 2018). Similar to the findings with NSSI (Allen & Hooley, 2018), affective states appear to modulate the latency in responding to stimuli. While content/affect split was elevated relative to the other rupture markers, the current study did not identify a statistically significant association when controlling for past suicide attempts. The association may not be captured in-session, since the time interval between the rupture occurrence and the eventual suicidal behavior are days apart.

Randall, Sareen and Bolton (2018) conducted a latent class analysis of suicide attempts to examine whether subgroups and their respective latent construct may identify factors associated with suicide attempt. The study included both static and dynamic factors that have been associated elevated suicide risk (e.g., prior treatment, diagnosis, firearm access, suicidal ideation, etc.). Despite identifying eight latent classes, the overall analysis fit statistics were below the accepted values that indicate adequate class separation, resulting in substantial overlap in the indicator variables. Similar to the current study, the latent class with the most deaths by suicide

within 12 months (5.8%) was also fitted with cases that endorsed "no suicidality" (92.6%). When examining only suicide attempts, a three-class solution fit the data that highlighted strongest association between static factors, such as male gender, polypharmacy to treat mental health disorders, reported childhood abuse and substance dependence.

In a proof of concept study for the "Suicide crisis syndrome," Yaseen, Hawes, Brazilay and Galynker (2018) generated criteria that sought to capture the clinical context associated with acute suicidal risk. Divided into several domains – entrapment, affective disturbance, loss of cognitive control, disturbance in arousal, social withdrawal – the suicide crisis syndrome classifies short-term suicidal risk based on the client's mental status. When the factors are identified at admission to the hospital, individuals meeting the criteria for the suicide crisis syndrome exhibited a sevenfold increase in relative risk of suicide attempt in the two months following discharge from the hospital. These researchers also found that variables capturing aspects of physiological arousal, cognitive distortions and withdrawal, and Frantic Hopelessness, characterized by low mood, entrapment and dread distinguished suicidal ideators with a history of attempt from individuals with no history of suicide attempts (Yaseen et al., 2010).

As part of the clinician's risk assessment, suicidal ideation is frequently utilized as an indicator that the patient may be experiencing a suicidal crisis. While suicidal ideation is highly associated with subsequent suicide behavior, a large-scale meta-analysis found that it has "modest" sensitivity and "low" predictive value. While they found a strong association, high heterogeneity between studies suggested that there were a multitude of other factors that may be more associated with subsequent suicidal behavior (McHugh et al., 2019). The authors cited a complex tradeoff between sensitivity and specificity that continues to challenge clinicians when conducting risk assessments.

The current study did not find an association between negative self-talk and subsequent suicide attempts. Recent linguistic analyses have sought to determine what components of narrative content is associated with mood states or times of acute crisis. Conducting a linguistic analysis of written narratives submitted on mental health online forums, Al-Mosaiwi and Johnstone (2018) found that anxiety, depression, and suicidal ideation posts contained more "absolutist" words than control posts. Additionally, suicidal ideation posts contained more absolutist words than anxiety and depression posts. Absolutist content is a form of cognitive distortion that is characterized by exaggerated perception or extreme appraisals of circumstances. Proportion of absolutist words were more closely associated with the severity of affective disorder compared to negative emotion words. (Al-Mosaiwi & Johnstone, 2018). Similar to this study, negative speech content in the current study was not associated with acute AEs, such as suicide attempt or suicidal ideation. Additionally, the intensity of the negative affective states was not related to near-term suicide attempts.

Clinical implications

Therapeutic alliance

Consistent with decades of psychotherapy process research, particular care and attention should be paid to developing and supporting a strong therapeutic alliance (e.g., Leahy, 2008; Norcross, 2002; Farber, Suzuki & Lynch, 2018). The strength of the therapeutic alliance in DBT is an essential component of effective treatment. While therapy ruptures are inevitable, the type of rupture may communicate essential clinical data about the client's mental status and risk for self-harm. Therapeutic ruptures, particularly withdrawal ruptures, occur frequently in DBT treatment. Attending to these ruptures, especially occasions when a patient's affect and verbal content are not congruent, may signal to the therapist that the patient requires additional support.

When coding content/affect split, the most frequent manifestation was when the client presented with a brighter affect coupled with negatively valenced content. For instance, a particularly salient example occurred when a young female client recounted in substantial detail her experience of her mother's emotional "cruelty," while simultaneously smiling and laughing.

While therapist factors were not modeled in this current study, the extent to which ruptures are addressed or resolved has been shown to be associated with improved outcomes (Boritz et al., 2018). The current study found, specifically, in-session content/affect split may represent a vulnerability that puts the patient at increased risk of NSSI behavior. While ruptures may occur as a reaction to the goals or tasks of therapy, additional attention should be paid to withdrawal ruptures that manifest during periods of intense emotion. As the client engages with the emotionally evocative content, the therapist may gain insight into how the client relates to the distressing feelings in their day-to-day experience – how they self-regulate, relate with others, and communicate needs. As a form of "moving away" from the therapist, content/affect split may also reflect a subtle marker that the client exhibits difficulty expressing emotional vulnerability in session. Emotional reactivity and incongruent affect could be an important signal of diffuse distress or even dissociation, which even occurs in the relative safety of the therapist's office. While not significantly associated in the multilevel model, elevations in content/affect split, relative to other types of ruptures, were also noted in those who attempted suicide during the study period.

While not available in the current study, phone coaching within DBT may be a further avenue of exploration. Clients, when consenting to DBT treatment, are orientated to the multiple uses of phone coaching, which include crisis-related skills consultation, rupture repair with the therapist and the disclosure of "good news" (Linehan, 2015). While skills consultation is the

most commonly used rationale for client initiating telephone coaching (Chalker et al., 2015), it remains unclear whether/when clients in the study utilized this out-of-session context to resolve a rupture with the therapist. With this mode of intervention, the therapeutic alliance may be strengthened and further influence various outcomes, both in terms of treatment outcomes and safety risk factors, over the course of treatment.

Non-suicidal self injury

The current study identified five "types" of sessions that may occur in treatment of clients with BPD. When examining the patterns of relating with their therapist, differential elevations in rupture types informed the identification of latent constructs. The profile associated with subsequent NSSI was characterized by content/affect split as well as a reluctance to provide verbal expression to the therapist about their feeling states, thoughts or experience. Instead, the client may manage their negative feelings by defending against or over-correcting the distressing experience. For example, despite discussing content that is unequivocally sad, the client may instinctually smile and laugh that may serve as an attempt to neutralize the feeling. However, the resulting emotional instability may instead further perpetuate the client's internal distress or even numbness. The client may opt to engage in NSSI as a means to mitigate these disquieting feelings. While NSSI behavior may serve a potent function in the moments following the behavior, recent EMA research suggests that the relief is brief and followed by more negative feelings. Despite conventional wisdom and client reports that they utilized NSSI to reduce negative affective experiences, there is evidence that suggests that NSSI behavior may do the opposite; after engaging in the NSSI behavior, clients also reported more negative feelings following the initiation of NSSI (Houben et al., 2017). Therapists can intervene by providing clients with psychoeducation regarding the limited efficacy of NSSI to manage uncomfortable

affective states while providing alternate ways of modulating their affective experiences. This notion may decrease client willfulness as they question the utility of implementing DBT skills targeting NSSI behavior. Tracking the phenomena on the diary card can also demonstrate the relationship to clients in a collaborative manner.

The DBT skill of "opposite action" should be used with caution when addressing the subgroup of clients who engaging in NSSI behavior. Opposite action implores the client to change distressing emotions by acting opposite to the emotional urge to do something. Clients who engage in content/affect split may have increased difficulty determining what affective state they are experiencing. In these moments, problem solving may be a more advantageous intervention in the short term since it does not require decoding complex emotional sensations that may be too challenging to name. If NSSI is related to deficits in emotional flexibility, opposite action may confuse clients to inadvertently reinforce troubling tendencies when the client is experiencing content/affect split, further limiting the ability to adequately enhance and suppress affect with relation to certain contexts. This task may be particularly challenging in circumstances where NSSI is an attractive coping strategy. More research needs to be done on individual components of DBT with regards to managing acute symptomology.

This pattern of in-session factors was also identified in the model building approach, the current study suggested that content/affect split predicted subsequent NSSI behavior. Difficulty modulating emotional content could be a vulnerability factor associated with the onset of NSSI behavior or contribute to urges to self-harm. Based on the findings on multiple EMA studies, "affective instability" and high levels of negative emotion predicted NSSI behavior in the near-term (Santangelo et al., 2017, p. 1433; Houben et al., 2017). The current study complements the findings that some form of emotional instability or misattunement, not negative emotions per se,

influence the onset of NSSI behavior. In the current study, this pattern of relating with negative emotion is associated with a 36% increase in the log-likelihood, for each occurrence of the rupture type, of NSSI prior to the next session.

Because emotional dysregulation is a key component of BPD and targeted directly within DBT treatment, it may be important to address subtle manifestations in session. While it is not possible in this study to explain the nuances of the client experience when content/affect split occurs, these could be moments where the client embodies a complex emotional state but has limitations in their ability or willingness to communicate (alexithymia). As modern emotion theorists have contended (Barrett, 2017), affective states do not occur in "pure" forms that easily match up within discrete categories (e.g., anger, fear, happiness). Instead, the environmental experience yields a complex mixture of physiological, neurological and cognitive sequela, pulling from experience, culture and associative learning, that produces a complex feeling state. For instance, the client could be encountering a multifaceted affective state that incorporates both positive and negative emotions that are difficult to hold simultaneously. An alternative explanation may be more psychodynamically oriented. Instead of sitting with uncomfortable feelings, the client reflexively initiates a more pleasant feeling state, leveraging humor, sarcasm or irony to insulate themselves from these intolerable feelings and attempt to modulate the intensity for themselves and the therapist. Seeking collaboration, the therapists can gently point out these instances of incongruence between content and affect state to explore the client's experience in the moment. Coupled with the exploration, the therapist may employ mindfulness skills (e.g., observe, describe and participate) in order to increase awareness and provide a voice to complex, dysregulating moods states. Across session, this behavior can be targeted and

tracked between sessions on the diary card – moments of incongruence, the emotions that are being experienced – and whether this pattern precedes an urge to engage in NSSI behavior.

Suicide Risk

The current study did not identify any in-session factors that predicted suicide attempt prior to the next session, which continues to perpetuate the enigmatic nature of suicidal behavior. When examining the occurrence of suicidal behavior within the latent profiles, 70% of the suicide attempts identified during the study appeared in the Unnamed profile with some of the lowest mean average frequencies of in-session markers. However, the fact remains striking that the sessions preceding a suicide attempt appeared virtually identical to sessions that did not precede any AE. When considering this notion in conjunction with the recent meta-analytic literature (Franklin et al., 2017; Belsher et al., 2019), it raises an important question about the role of therapy in the domain of suicide risk assessment. Given the limited amount of time the client spends in the therapy office, it may be unreasonable to expect a therapist to capture subtle risk factors beyond the standard risk assessment questions. Therapist may consider leveraging other avenues to help maintain client safety, such as contacting collateral, coping ahead for impending out-of-session stressors and considering phone coaching if not offered.

Clinician judgment is more reliable in predicting short-term prospective suicide risk than a validated risk assessment tool (e.g., Fowler, 2012). However, the use of standardized measures contributes to a therapist's sense of relative risk, suggesting that judgment mediates the relationship with subsequent outcomes. Aligned with the APA recommendations for clinicians, therapists should utilize standardized measures in conjunction with clinical judgement to best determine relative risk. Clients in a suicide crisis may challenge therapists to manage unflattering and uncomfortable countertransference, which may deteriorate the therapeutic

alliance if not properly addressed. The study by Yaseen and colleagues (2017) found that psychiatry residents' experience of conflicting emotional responses was associated with higher rates of suicidal behavior among patients at follow-up. This finding suggests that therapists are well advised to monitor their own emotional reactions to patients that tacitly pick up on resentment or frustration. As a curious parallel, the rupture marker content/affect split, which manifests in subtle incongruences of conflicting emotional states, was associated with NSSI in the current study.

When therapists reliably identify the presence of suicide risk, safety plans are a useful strategy for minimizing that risk. Safety Planning Intervention (SPI) is an evidence-base method for addressing suicide risk at any level of acuity by addressing static and dynamic risk factors (Stanley & Brown, 2012). The Zero Suicide Model utilizes safety planning in a manner that emphasizes ten discrete steps across three core components: assess, intervene and monitor. At the assessment level, therapists determine whether the client exhibits characteristics that are associated with elevated risk for suicidal behavior, such as suicidal ideation, intent or plan as well as demographic correlates. While these factors are likely to be overly sensitive and lack specificity, the task for this component involves simply deciding if the individual is at risk. If determined that the client exhibits elevated risk, the therapist can intervene by initiating a SPI, lethal means reduction and skill building. Lastly, the model focuses on monitoring the client by engaging family, social support and additional contact during acute periods (Brodsky, Spruch-Feiner & Stanley, 2018). By utilizing an over-inclusive, "universal precautions" model of suicide risk assessment, the problem of not knowing when an individual is likely to attempt suicide may be solved less by prediction, than by adequate monitoring.

Limitations

Given the relatively limited sample size (98 coded sessions across 22 clients), there was limited statistical power to run more complicated multilevel models. While each model contained a nested structure with the addition of fixed effect variables, because of limited power, it was not feasible to model inter-level or intra-level interaction effects, to treat each in-session marker as a random effect or to control for all relevant demographic variables (Level 2). Also, with a larger sample size, the LPA may have adequately populated a six-profile solution in line with the model fit statistics (*AIC*, *BIC*). It is possible that a six-profile solution may have provided improved specificity regarding the types of AEs that are associated with certain session types.

Suicide-related behaviors all have a very low base rate, as such, as in all other studies that have attempted to prospectively study suicide, power was difficult to optimize. Despite an inclusion criterion that required a history of self-harm, the current study identified a total of 10 suicide attempts during the duration of the study. These suicide attempts were reported by the client on their diary cards, and identified to the research team in-session during the therapist's exploration of the client's diary card. The current study noted an inconsistency, in both suicidal behavior and NSSI, between what was reported to the clinician during sessions and what was reported to the research team on standardized assessments. While the reasons for this inconsistency remain unclear, the differential reporting could be motivated by impression management. For instance, a client may embellish symptoms as a means to communicate to the therapist that things are not going well. Meanwhile, a client may withhold symptoms – primarily those related to suicide risk – because of concerns related to the outcome of their disclosure, which may include practice concerns (e.g., involuntary hospitalization, information sharing, etc.)

or the reactions of the person they are disclosing to (Blanchard & Farber, 2018). With the suicide attempts reported during the diary card portions of the sessions, there is also no knowing the severity and lethality of the attempt. Suicide attempts that had higher lethality seemed to be identified to the research arm of the study; meanwhile, the other suicide attempts involved ingestion of substances with a reported intent to die. During the analysis of the current study, all suicide attempts were treated equally.

While the study examined the session prior to adverse events, the statistical models do not account for the time between the session and the AE. Based on this fact, the interval of time between in-session markers and the event could span from several hours (e.g., the evening after session) to nearly seven days (e.g., the morning of the following session). As more studies examine suicidal behavior and NSSI with in vivo methods such as EMA, it is becoming increasingly clear that factors that contribute to the onset of behavior are rapid, transient and multifaceted (e.g., Ammerman et al., 2017; Santangelo et al., 2017). Consistent with these findings, in-session factors and behaviors are possibly too distal to capture the dynamic factors that facilitate a suicide attempt.

Based on the sample's homogenous clinical demographics, the findings of this study may not be generalizable to all NSSI behavior. While the majority of the sample had comorbid depression (82%), all included patients met criteria for BPD via the SCID-II (First et al., 1997). The manifestation of NSSI behavior may differ in clients with a primary mood, psychotic or obsessive disorders. Given the symptom profile associated with BPD, the phenomenology of self-harm behavior in BPD may be fundamentally different.

The current study coded videotaped sessions of only one therapist for all included patients. This component of study design offers mixed benefits and complications. On the one

hand, utilizing the videotaped sessions from one therapist can "control for" therapist effects – such as style of relating, gender, appearance, etc. – since each client receives the same treater. Relational psychotherapy theory highlights the importance of therapist factors in the intersubjective experience of a therapeutic dyad. The client's transferential experience of the therapist is an essential part of treatment that may either facilitate healing, or contribute to distress and impact therapy outcomes (e.g., Cameron et al., 2018). However, these therapist factors may limit the generalizability of the study, since unmeasured therapist factors may contribute to the manifestations of in-session markers (Safran, 2003).

Therapeutic ruptures are ubiquitous within psychotherapy; however, each rupture does not have the same impact on the course of therapy and the relationship with the therapist. The current study examined the frequency of specific types of ruptures, but did not seek to measure the intensity. Compounding the complexity, ruptures from an unknown previous session may yield relational sequelae that may not be accounted for in the viewing of the dyadic process. In this study, rupture type – withdrawal versus confrontation – may have served as a proxy measure for rupture intensity. Withdrawal ruptures tend to be subtle, understated, and frequent. The therapist may be less likely to explicitly address them in the moment. Confrontation ruptures, on the other hand, tend to be very salient, disruptive and lend to direct explicit therapeutic intervention. As such, confrontation ruptures may be of greater intensity since the categorization of confrontation ruptures insinuates verbalized conflict.

Unlike other studies examining therapeutic interactions (e.g., Yaseen et al., 2017; Bedics et al., 2015; Boritz et al., 2018), the current study to did not model therapist resolution strategies that occurred to address the in-session ruptures. Using the same 3RS coding scheme, Boritz et al., (2018) found that unresolved ruptures, or ruptures where the therapist did not adequately

address the needs or concerns of the client, predicted poorer outcomes. Identifying ruptures that have not been adequately addressed may be a better predictor of AEs than using an overall count of these events. Having a one-sided approach (that is, coding only the client portion of the dyad) overlooks the therapist factors that may be associated with AEs.

Future directions

The current study attempted to examine time-proximate factors during the last encounter with a mental health profession prior to self-harm behavior. With the limitations listed above related to the dimension of time, there may be observable behavioral indicators of acute crisis preceding NSSI and suicide attempts. Clinicians often use suicidal ideation as an indicator of suicide risk; however, suicidal ideation tends to be episodic, with rapid onset but short duration. Meanwhile, factors that are associated with suicidal ideation over the course of weeks, months, and years do not adequately predict elevated risk of suicide attempt over shorter timeframes, such as days and hours (Kleiman & Nock, 2018; Torous et al., 2018). In addition to suicidal ideation, additional risk factors need to be identified that are more sensitive and specific to suicidal behavior. To explore and identify these potential factors, studies that use EMA methods that are more time-proximate – within minutes or seconds of the behavior – to capture phenomena preceding the suicide trigger state or suicide crisis syndrome. With advances in smartphone applications, wearable technology and EMA techniques, collecting precise measurements that capture momentary changes and modulations of physiological systems, movement, behavior and mental status may identify sensitive and specific variables of interest (Torous et al., 2018). With the development of machine learning techniques, algorithms may be adopted that synthesize these time-dependent risk factors as a point of intervention.

Based on the primary finding of the study, more research is needed on content/affect split and incongruent affect. While seen frequently in clinical contexts, there is limited exploration of the phenomena and its sequelae in the literature.

Table 1

Research Questions

1. What is the mean frequency of in-sessions factors (i.e., withdrawal and confrontation ruptures, negative self-talk, psychomotor agitation) in the session prior to the occurrence of self-harm events in DBT treatment?
2. Is there an association between in-session factors (i.e., withdrawal and confrontation ruptures, negative self-talk, psychomotor agitation) in the session prior to the occurrence of self-harm events in DBT treatment?
3. Which specific types of in-session markers (i.e., withdrawal and confrontation ruptures, negative self-talk, psychomotor agitation) have the strongest association during the session prior to self-harm events in DBT treatment?

Note: DBT = Dialectical Behavior Therapy. Withdrawal and confrontation ruptures coded via the Rupture Resolution Rating System (3RS; Eubanks-Carter, Muran & Safran, 2015).

Table 2

Rupture Resolution Rating System (3RS) Coding Markers

Withdrawal rupture markers
Denial
Minimal response
Abstract communication
Avoidant storytelling and/or shifting topic
Deferential and appeasing
Content/affect split
Self-criticism and/or hopelessness
Confrontation rupture markers
Complaints/concerns about the therapist
Patient rejects therapist intervention
Complaints/concerns about the activities of therapy
Complaints/concerns about the parameters of therapy
Complaints/concerns about progress in therapy
Patient defends self against therapist
Efforts to control/pressure therapist

Note: Withdrawal and confrontation ruptures coded via the Rupture Resolution Rating System (3RS; Eubanks-Carter, Muran & Safran, 2015).

Table 3

Demographics of included participants (N = 22)

	n / Mean (*SD*)	% of sample
Gender		
Female	20	91
Male	2	9
Race		
Asian	2	9
Black	3	14
Caucasian/White	12	54
Hispanic/Latino(a)	0	0
More than one	5	23
Age	31.6 (12.3) years	--
Sexual Orientation		
Heterosexual	16	73
Homosexual	3	14
Bisexual	2	9
Not Sure	1	4
Highest Education Earned	15.2 (2.2) years	--
High School or GED	2	9
Some college	9	41
Bachelor's Degree	8	36
Graduate School	3	14
Household Income		
$10,000 or less	3	14
$10,000 - 14,999	1	4
$15,000 - 19,999	3	14
$20,000 - 29,999	3	14
$30,000 – 39,999	2	9
$40,000 – 49,999	2	9
$50,000 – 59,999	1	4
$60,000 – 69,999	3	14
$70,000 or above	4	18

Note: Participants are derived from a subsample of another study that compared the effectiveness of DBT with medication management.

Table 4

Clinically relevant factors of included participants (N = 22)

Factors	*n*	% of sample
History of abuse	17	77
None	5	23
Physical Only	5	23
Sexual Only	5	23
Both	7	31
Comorbid Axis 1 Diagnosis	19	86
Major Depression	18	82
Bipolar Disorder	1	4
Remitted	3	14
Current medication trials	7	32
Zolpidem (Ambien)	2	9
Clonazepam (Klonopin)	5	23
Prior Drug Use	8	36
Cannabis	5	23
Stimulants	3	13
Opiates	3	13
Hallucinogens	1	4
Prior psychotherapy		
Yes	21	96
No	1	4

Note: Participation in the study required participants to discontinue all SSRI medications. Axis 1 diagnosis was determined through the administration of the SCID-I.

Table 5

Frequency of lifetime suicide attempts and mean suicide lethality score of most lethal suicide attempt (N = 22)

	n / Mean (*SD*)	% of sample
History of at least one lifetime suicide attempt	20	91
Number of lifetime suicide attempts		
None	2	9
One	4	18
2-5 times	6	27
6-10 times	5	23
11-25 times	2	9
25-50	2	9
50+	1	5

Table 6

Frequency of lifetime episodes of non-suicidal self injury behavior (N = 22)

	n	% of sample
Frequency of lifetime NSSI episodes	19	86
None	3	14
Once	0	0
2-5 times	1	4.5
6-10 times	1	4.5
11-25 times	2	9
25-50	5	23
50+	10	45

Note: NSSI = non-suicidal self injury.

Table 7

Number of videotaped sessions with therapist over the six month study period (N = 22)

Average number of sessions	16.7 (*SD* = 7.4)
Median number of sessions	8.2

Table 8

Number of randomized and content-selected videotaped sessions coded, by adverse event type (N = 22)

Adverse Event	61
NSSI behavior	13
NSSI Urge	16
Suicide Attempt	10
Suicidal Ideation	22
Non-Event Sessions	37
Total # of Sessions	98

Note: NSSI = non-suicidal self injury.

Table 9

Reported frequency of self-harm behavior in Diary Card, by type, across coded sessions (n = 98)

Type of behavior	Frequency across coded sessions	Number of patients	% of Sample
All types	13	8	36
Cutting	6	6	27
Self-hitting	4	4	18
Self-induced vomiting (Purging)	3	2	9

Note: *n* = the total number of randomized sessions coded.

Table 10

Reported frequency of discrete NSSI urges and suicidal ideation in Diary Card, by type, across coded sessions (n = 98)

Type of urge/ideation	Frequency across coded sessions	Number of patients	% of Sample
NSSI urge	16	7	32
SI	22	13	59

Note: NSSI = Non-suicidal self injury; SI = Suicidal ideation; *n* = the total number of semi-randomized sessions coded.

Table 11

Reported frequency of suicide attempts or gestures on Diary Card, by type, across coded sessions (n = 98)

Type of adverse event	Frequency	*n*	% of Sample
Suicide Attempt	10	5	23
Intentional overdose	10	5	23

Note: *n* = the total number of randomized sessions coded.

Table 12

Average frequencies and standard deviations of in-session markers per coded session (n = 98)

In-session marker	Mean (*SD*)	Occurrences	% of coded sessions
Withdrawal Ruptures (all)	12.9 (7.7)	1189	100
Deferential	1.9 (1.6)	183	81
Content/Affect Split	3.8 (2.8)	370	92
Abstract Communication	1.8 (2.0)	174	71
Minimal Response	2.1 (2.5)	203	66
Confrontation Ruptures (all)	2.7 (2.7)	259	80
Defends Self	.8 (1.2)	75	80
Negative Self Talk	.5 (1.0)	13	
Mean Frequency	0.57 (1.07)	42	28
Negative emotion score	18.8 (9.8)	--	
Agitation (in seconds)	1.1 (8.8)	3	3

Note: In-session markers are coded via the 3RS coding scheme; coded in five-minute intervals within individual psychotherapy sessions; negative emotion score calculated using LIWC linguistic analysis.

Table 13

Mean frequencies and standard deviations in sessions prior to adverse events and non-event sessions

In-session marker	Suicide Attempt M (*SD*) *n* = 10	Suicidal Ideation M (*SD*) *n* = 22	NSSI Behavior M (*SD*) *n* = 13	Non-Event M (*SD*) *n* = 37
Withdrawal Ruptures (all)	8.11 (3.62)	13.28 (6.68)	16.75 (9.26)	11.47 (6.33)
Deferential	1.44 (1.33)	2.76 (2.35)	2.58 (1.98)	1.51 (1.65)
Content/Affect Split	2.11 (1.05)	4.52 (2.68)	6 (3.16)	3.72 (2.62)
Abstract Communication	1.44 (1.01)	1.56 (1.61)	2.08 (1.88)	1.62 (2.38)
Minimal Response	1.67 (1.93)	2.24 (2.83)	1.92 (2.27)	2.05 (2.62)
Confrontation Ruptures (all)	2.56 (3.4)	2.76 (2.35)	3.5 (2.65)	2.69 (2.77)
Defends Self	1.44 (1.74)	1 (1.32)	1.33 (1.44)	1.37 (1.39)
Negative Self Talk				
Mean Frequency	.44 (.73)	.6 (1.22)	1 (1.21)	.4 (.88)
Negative emotion score	18.35 (2.33)	15.81 (9.51)	19.65 (7.61)	18.58 (7.24)
Agitation (in seconds)	0	0	0	3.38 (14.51)

Note: In-session markers are coded via the 3RS coding scheme; coded in five-minute intervals within individual psychotherapy sessions; negative emotion score calculated using LIWC linguistic analysis.

Table 14

Comparison between means of in-session factors prior to adverse events and randomized sessions that did not precede an adverse event

In-session marker		Adverse Event Type		
		Suicide Attempt (n = 10)	Suicidal Ideation (n = 22)	NSSI Behavior (n = 13)
Withdrawal (all)		-1.186	1.15	4.03**
	Deferral	-.59	2.06*	2.25*
	Content/Affect Split	-1.50	2.03*	3.25*
	Abstract Communication	.39	.84	1.51
	Minimal Response	.37	.12	2.71*
Confrontation (all)		-.45	.30	.63
	Defend Self	.66	.60	.25
Negative Self Talk		-1.09	-1.49	1.97
		df = 9	df = 21	df = 12

Note: Paired t scores represents the paired mean comparison between participants' adverse event session frequencies with non-event frequencies. * = $p < .05$, ** = $p < .01$. df = degrees of freedom. SI = suicidal ideation. NSSI = non-suicidal self injury.

Table 15

Latent Profile Analysis fit statistics for two to seven profile solutions to the manifestation of in-session factors within sample of DBT treatment

Model	Log Likelihood	*AIC*	*BIC*	*SSABIC*	Entropy
Two profiles	1151.034	2340.069	2389.376	2329.373	.992
Three profiles	1121.702	2295.405	2362.878	2280.769	.986
Four profiles	1102.515	2271.03	2356.669	2252.454	.949
Five profiles	1090.83	2261.66	2365.465	2239.142	.937
Six profiles	1067.95	2229.901	2351.871	2203.443	.969
Seven profiles	1067.692	2243.52	2383.52	2212.986	.859

Note: *AIC* = Akaike Information Criterion, *BIC* = Bayesian Information Criterion, *SSABIC* = Sample Size Adjusted BIC.

Table 16

Proportion of adverse event occurrence within latent profiles for Level 1, DBT Sessions

Type of Adverse Event Following Session	Latent Profiles Proportion (*n*)				
	Profile 1: Unnamed	Profile 2: Aggressive Distancing	Profile 3: Indirect Hostility	Profile 4: Internalized Aggression	Profile 5: Acquiescent
Suicide Attempt (*n* = 10)	.7 (7)	.2 (2)	.1 (1)	0	0
Suicidal Ideation (*n* = 22)	.45 (10)	.09 (2)	.09 (2)	.14 (3)	.23 (5)
NSSI Behavior (*n* = 13)	.3 (4)	.07 (1)	.07 (1)	.46 (6)	.07 (1)
No Adverse Event (*n* = 30)	.77 (23)	.1 (3)	.1 (3)	.03 (1)	0

Note: NSSI = non-suicidal self injury.

Table 17

General linear model fit by full information maximum likelihood of in-session markers prior to NSSI behavior

	Estimate	Standard Error	*Z* Value	Sig
Intercept	-5.45	1.88	-2.89	.003**
Split	.30	.15	2.03	.04*
LIFESIB	.39	.31	1.25	.21

Note: Split = Content/Affect Split, LIFESIB = Lifetime frequency of NSSI. 1 | Subject = nested variable. *AIC* = Akaike Information Criterion, *BIC* = Bayesian Information Criterion. * $p < .05$, ** $p < .01$.

Table 18

Comparison between intercept multilevel model and fixed effect general linear model with in-session markers prior to NSSI behavior

Model	*df*	*AIC*	*BIC*	Deviance	χ^2	Sig
Intercept (1 | Subject)	2	86.57	91.74	82.57		
NSSI Model Split + LIFESIB + (1 | Subject)	4	83.89	94.23	75.89	6.68	.03*

Note: Split = Content/Affect Split, LIFESIB = Lifetime frequency of NSSI. 1 | Subject = nested variable. *AIC* = Akaike Information Criterion, *BIC* = Bayesian Information Criterion. * $p < .05$, ** $p < .01$.

Table 19

General linear model fit by full information maximum likelihood of in-session markers prior to suicide attempt

	Estimate	Standard Error	*Z* Value	Sig
Intercept	-4.97	2.24	-2.21	.03*
Tot_SA_all	1.12	.56	2.03	.04*
CON	.39	.31	1.25	.35
WD	-.13	.11	-1.17	.24

Note: Tot_SA_all = Lifetime total suicide attempts, CON = composite of in-session confrontation ruptures, WD = composite of in-session withdrawal ruptures. * $p < .05$, ** $p < .01$.

Table 20

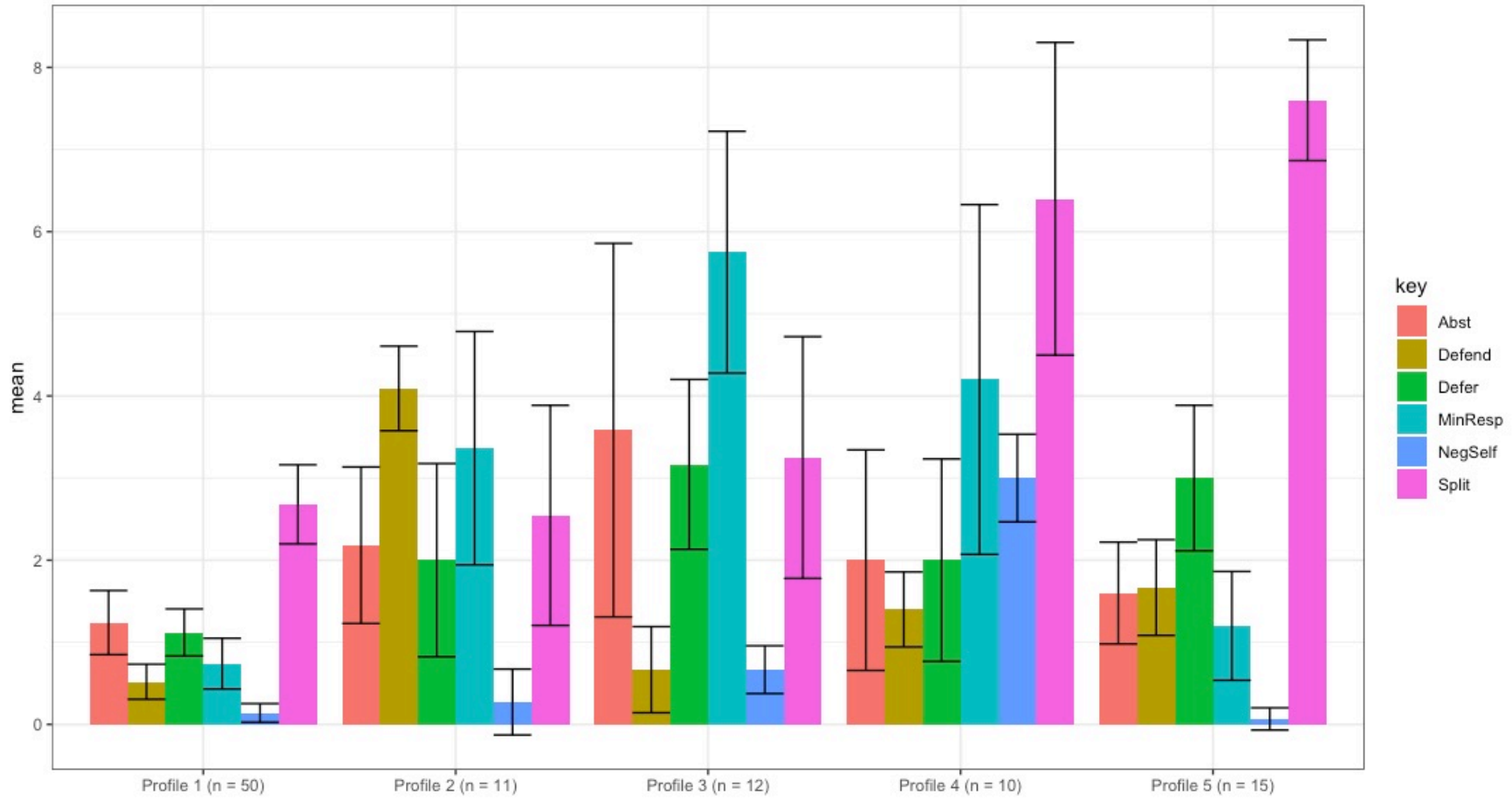
Comparison between intercept multilevel model and fixed effect generalized linear model with in-session markers prior to suicide attempt

Model	*df*	*AIC*	*BIC*	Deviance	χ^2	Sig
Intercept (1 | Subject)	2	69.85	75.02	65.85		
Suicide Attempt Model WD + CON + Tot_SA_all + (1 | Subject)	5	65.73	78.65	55.72	10.13	.02*

Note: MinResp = Minimal Response, Defend = Defends self against the therapist. Tot_SA_all = lifetime number of suicide attempts. 1 | Subject = nested variable. *AIC* = Akaike Information Criterion, *BIC* = Bayesian Information Criterion. * $p < .05$, ** $p < .01$.

Figure 1

Profile plots of Latent Profile Analysis (LPA) of in-session markers with five profile solution (N = 98)



Note: Abst = Abstract Communication; Defend = Patient Defends Self against Therapist; Defer = Deferential towards Therapist; MinResp = Minimal Response to Therapist; NegSelf = Negative Self-Talk; Split = Content/Affect Split

Table 21

Pearson correlations and two-tailed significance levels between coded in-session markers (N = 98)

		WD	CON	Defer	Split	Abst	MinResp	NegSelf	Defend
WD	Pearson Correlation	1	.388**	.602**	.590**	.407**	.551**	.469**	.253*
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.012
	N	98	98	98	98	98	98	98	98
CON	Pearson Correlation	.388**	1	.166	.121	.142	.283**	.251*	.725**
	Sig. (2-tailed)	.000		.102	.235	.163	.005	.013	.000
	N	98	98	98	98	98	98	98	98
Defer	Pearson Correlation	.602**	.166	1	.316**	.366**	.151	.118	.095
	Sig. (2-tailed)	.000	.102		.002	.000	.137	.248	.351
	N	98	98	98	98	98	98	98	98
Split	Pearson Correlation	.590**	.121	.316**	1	.035	-.019	.200*	.096
	Sig. (2-tailed)	.000	.235	.002		.731	.850	.049	.346
	N	98	98	98	98	98	98	98	98
Abst	Pearson Correlation	.407**	.142	.366**	.035	1	.070	.039	.116
	Sig. (2-tailed)	.000	.163	.000	.731		.495	.705	.254
	N	98	98	98	98	98	98	98	98
MinResp	Pearson Correlation	.551**	.283**	.151	-.019	.070	1	.377**	.221*
	Sig. (2-tailed)	.000	.005	.137	.850	.495		.000	.029
	N	98	98	98	98	98	98	98	98
NegSelf	Pearson Correlation	.469**	.251*	.118	.200*	.039	.377**	1	.053
	Sig. (2-tailed)	.000	.013	.248	.049	.705	.000		.607
	N	98	98	98	98	98	98	98	98
Defend	Pearson Correlation	.253*	.725**	.095	.096	.116	.221*	.053	1
	Sig. (2-tailed)	.012	.000	.351	.346	.254	.029	.607	
	N	98	98	98	98	98	98	98	98

Note: **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). WD = Withdrawal Ruptures; CON = Confrontation Ruptures; Abst = Abstract Communication; Defend = Patient Defends Self against Therapist; Defer = Deferential towards Therapist; MinResp = Minimal Response to Therapist; NegSelf = Negative Self-Talk; Split = Content/Affect Split.

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